1. Ray R has starting point e=$\begin{bmatrix}-10.43 & -6.01 & -2.83\end{bmatrix}$
   and direction d=$\begin{bmatrix}-0.56 & 0.37 & 0.74\end{bmatrix}$
   . Polygon P has vertices $\begin{bmatrix}-5.4 & -5.8 & -7.4\end{bmatrix}$
   $\begin{bmatrix}-4.75 & 0.75 & -9.36\end{bmatrix}$
   $\begin{bmatrix}-3.22 & -3.18 & -4.35\end{bmatrix}$
   $\begin{bmatrix}-5.84 & -7.11 & -7.62\end{bmatrix}$
   $\begin{bmatrix}-5.18 & -2.75 & -8.49\end{bmatrix}$
   .
   b) What is the normal to P?
   c) What is the t intersection point of R and P?
   d) What is the (x, y, z) intersection point on R at t?
   e) Is the intersection point inside the polygon?
   f) Is the intersection point in front of the viewpoint e?

2. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 3) in a 272 x 559 image with the following parameters? l=-3, r=-1, b=-2, t=2 view type = perspective
   camera origin = $\begin{bmatrix}-5.0 & 3.0 & 2.0\end{bmatrix}$
   camera u axis = $\begin{bmatrix}0.89 & 0.45 & 0.0\end{bmatrix}$
   camera v axis = $\begin{bmatrix}0.56 & 0.74 & 0.37\end{bmatrix}$
   camera w axis = $\begin{bmatrix}0.18 & 0.37 & -0.91\end{bmatrix}$
   image plane at distance 1 in front of viewpoint

3. Ray R has starting point e=$\begin{bmatrix}-2.07 & -4.27 & 1.42\end{bmatrix}$
   and direction d=$\begin{bmatrix}-0.0 & 0.24 & -0.97\end{bmatrix}$
   . Polygon P has vertices $\begin{bmatrix}-1.91 & -6.35 & 2.88\end{bmatrix}$
   $\begin{bmatrix}-4.66 & 1.42 & -0.32\end{bmatrix}$
   $\begin{bmatrix}-1.91 & -3.46 & -0.02\end{bmatrix}$
   $\begin{bmatrix}-3.29 & -2.24 & 1.05\end{bmatrix}$
   $\begin{bmatrix}-2.83 & -1.32 & -0.63\end{bmatrix}$
   .
   b) What is the normal to P?
   c) What is the t intersection point of R and P?
   d) What is the (x, y, z) intersection point on R at t?
   e) Is the intersection point inside the polygon?
   f) Is the intersection point in front of the viewpoint e?

4. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 3) in a 450 x 431 image with the following parameters? l=-2, r=-1, b=-4, t=1 view type = perspective
   camera origin = $\begin{bmatrix}3.0 & -1.0 & -3.0\end{bmatrix}$
   camera u axis = $\begin{bmatrix}0.17 & 0.51 & -0.85\end{bmatrix}$
   camera v axis = $\begin{bmatrix}-0.87 & 0.22 & -0.44\end{bmatrix}$
   camera w axis = $\begin{bmatrix}0.0 & 1.0 & 0.0\end{bmatrix}$
   image plane at distance 3 in front of viewpoint

5. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 3) in a 463 x 319 image with the following parameters? l=2, r=4, b=0, t=1 view type = perspective
   camera origin = $\begin{bmatrix}3.0 & -3.0 & 0.0\end{bmatrix}$
   camera u axis = $\begin{bmatrix}-0.24 & 0.94 & 0.24\end{bmatrix}$
   camera v axis = $\begin{bmatrix}-0.71 & -0.57 & 0.42\end{bmatrix}$

camera w axis = $\begin{bmatrix}-0.75 & -0.6 & 0.3\end{bmatrix}$
image plane at distance 4 in front of viewpoint

6. Ray R has starting point e=$\begin{bmatrix}1.52 & -1.1 & 0.49\end{bmatrix}$
and direction d=$\begin{bmatrix}0.78 & 0.62 & -0.0\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}2.7 & -1.06 & 0.13\end{bmatrix}$
$\begin{bmatrix}3.6 & -2.7 & -0.91\end{bmatrix}$
$\begin{bmatrix}2.11 & -0.02 & 0.73\end{bmatrix}$
$\begin{bmatrix}1.81 & -3.3 & -6.58\end{bmatrix}$
$\begin{bmatrix}3.3 & -4.34 & -4.94\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

7. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 3) in a 709 x 359 image with the following parameters? l=-1, r=0, b=-1, t=4 view type = perspective
camera origin = $\begin{bmatrix}3.0 & -4.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.56 & -0.37 & -0.74\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.73 & 0.49 & 0.49\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.37 & -0.91 & 0.18\end{bmatrix}$
image plane at distance 3 in front of viewpoint

8. Ray R has starting point e=$\begin{bmatrix}-4.45 & 8.52 & 4.58\end{bmatrix}$
and direction d=$\begin{bmatrix}0.2 & -0.59 & -0.78\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}1.17 & 4.71 & -1.16\end{bmatrix}$
$\begin{bmatrix}1.74 & 5.84 & -2.29\end{bmatrix}$
$\begin{bmatrix}1.88 & 8.95 & -4.27\end{bmatrix}$
$\begin{bmatrix}5.7 & 0.32 & -2.15\end{bmatrix}$
$\begin{bmatrix}3.01 & 4.14 & -2.29\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

9. Ray R has starting point e=$\begin{bmatrix}5.5 & -1.04 & -3.62\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.17 & -0.7 & 0.7\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-0.06 & -2.94 & -0.71\end{bmatrix}$
$\begin{bmatrix}6.77 & -1.76 & -2.83\end{bmatrix}$
$\begin{bmatrix}0.41 & -3.18 & -2.12\end{bmatrix}$
$\begin{bmatrix}6.3 & -0.59 & 2.36\end{bmatrix}$
$\begin{bmatrix}-0.06 & -2.94 & -0.71\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?

d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

10. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 1) in a 398 x 365 image with the following parameters? l=2, r=3, b=-4, t=2 view type = orthographic camera origin = $\begin{bmatrix}-4.0 & 3.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.0 & -1.0 & 0.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.2 & -0.78 & 0.59\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.2 & -0.78 & -0.59\end{bmatrix}$

11. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 1) in a 349 x 600 image with the following parameters? l=-5, r=2, b=-5, t=-1 view type = orthographic camera origin = $\begin{bmatrix}4.0 & -5.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.71 & 0.71 & 0.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.53 & 0.27 & 0.8\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.93 & 0.0 & -0.37\end{bmatrix}$

12. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 2) in a 659 x 673 image with the following parameters? l=-3, r=-2, b=-5, t=2 view type = perspective camera origin = $\begin{bmatrix}0.0 & -2.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.3 & 0.9 & -0.3\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.22 & -0.87 & 0.44\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.71 & 0.0 & 0.71\end{bmatrix}$
image plane at distance 3 in front of viewpoint

13. Ray R has starting point e=$\begin{bmatrix}-9.58 & 1.82 & 1.08\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.73 & -0.49 & -0.49\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}4.39 & 2.0 & 3.28\end{bmatrix}$
$\begin{bmatrix}-6.75 & 1.63 & 0.9\end{bmatrix}$
$\begin{bmatrix}0.19 & 1.82 & 2.37\end{bmatrix}$
$\begin{bmatrix}-5.1 & 0.36 & 0.72\end{bmatrix}$
$\begin{bmatrix}-1.09 & 2.0 & 2.18\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

14. Ray R has starting point e=$\begin{bmatrix}-6.34 & -0.08 & 0.44\end{bmatrix}$
and direction d=$\begin{bmatrix}0.3 & 0.9 & 0.3\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-3.78 & 0.86 & -0.55\end{bmatrix}$
$\begin{bmatrix}-0.45 & 4.2 & 2.78\end{bmatrix}$
$\begin{bmatrix}-1.23 & 6.55 & 4.35\end{bmatrix}$
$\begin{bmatrix}-2.41 & 2.23 & 0.82\end{bmatrix}$
$\begin{bmatrix}-1.82 & 3.61 & 2.0\end{bmatrix}$
.

b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

15. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 4) in a 375 x 433 image with the following parameters? l=0, r=2, b=-4, t=1 view type = orthographic
camera origin = $\begin{bmatrix}-2.0 & 0.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.2 & -0.59 & -0.78\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.41 & 0.41 & 0.82\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.73 & -0.49 & -0.49\end{bmatrix}$

16. Ray R has starting point e=$\begin{bmatrix}2.77 & -0.96 & -1.83\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.41 & -0.82 & 0.41\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}1.0 & -3.0 & -2.41\end{bmatrix}$
$\begin{bmatrix}3.83 & -0.17 & -1.71\end{bmatrix}$
$\begin{bmatrix}0.29 & -3.71 & -0.29\end{bmatrix}$
$\begin{bmatrix}1.71 & -2.29 & -3.12\end{bmatrix}$
$\begin{bmatrix}-1.83 & -5.83 & -0.29\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

17. Ray R has starting point e=$\begin{bmatrix}-3.93 & -4.77 & 3.4\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.62 & 0.62 & -0.47\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}0.94 & -0.12 & -1.97\end{bmatrix}$
$\begin{bmatrix}-0.76 & -8.85 & 0.21\end{bmatrix}$
$\begin{bmatrix}-5.61 & -7.88 & -0.03\end{bmatrix}$
$\begin{bmatrix}-5.37 & -7.88 & -0.03\end{bmatrix}$
$\begin{bmatrix}-3.43 & -2.06 & -1.49\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

18. Ray R has starting point e=$\begin{bmatrix}-5.41 & 0.97 & 0.6\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.83 & -0.0 & 0.55\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}3.0 & -5.0 & 2.0\end{bmatrix}$
$\begin{bmatrix}-6.0 & 2.0 & 2.0\end{bmatrix}$
$\begin{bmatrix}-6.0 & 1.0 & 2.0\end{bmatrix}$
$\begin{bmatrix}1.0 & -1.0 & 2.0\end{bmatrix}$
$\begin{bmatrix}-1.0 & 2.0 & 2.0\end{bmatrix}$

.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

19. Ray R has starting point e=$\begin{bmatrix}-2.21 & 1.26 & -6.76\end{bmatrix}$
and direction d=$\begin{bmatrix}0.2 & -0.0 & 0.98\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-1.98 & 1.25 & -2.9\end{bmatrix}$
$\begin{bmatrix}-0.38 & 1.25 & -1.29\end{bmatrix}$
$\begin{bmatrix}-1.52 & 1.94 & -2.21\end{bmatrix}$
$\begin{bmatrix}3.29 & 5.38 & 3.75\end{bmatrix}$
$\begin{bmatrix}3.29 & 7.44 & 4.44\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

20. Ray R has starting point e=$\begin{bmatrix}7.8 & -8.43 & 0.9\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.39 & 0.65 & 0.65\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}6.91 & -5.73 & 1.09\end{bmatrix}$
$\begin{bmatrix}5.94 & -5.49 & 4.24\end{bmatrix}$
$\begin{bmatrix}5.94 & -5.49 & 1.09\end{bmatrix}$
$\begin{bmatrix}4.0 & -5.0 & 8.61\end{bmatrix}$
$\begin{bmatrix}5.94 & -5.49 & 3.51\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

21. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 3) in a 453 x 408 image with the following parameters? l=-5, r=-4, b=-4, t=-3 view type = orthographic
camera origin = $\begin{bmatrix}-5.0 & -2.0 & -5.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.95 & 0.0 & -0.32\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.67 & -0.33 & 0.67\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.6 & 0.3 & -0.75\end{bmatrix}$

22. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 1) in a 484 x 648 image with the following parameters? l=-2, r=0, b=-3, t=2 view type = orthographic
camera origin = $\begin{bmatrix}-5.0 & -1.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.59 & -0.2 & 0.78\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.49 & -0.49 & -0.73\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.47 & -0.62 & 0.62\end{bmatrix}$

23. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 2) in a 362 x 260 image with the following parameters? l=2, r=3, b=-3, t=-2 view type = perspective
camera origin = $\begin{bmatrix}-1.0 & -3.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.78 & -0.59 & 0.2\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.37 & 0.56 & 0.74\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.33 & 0.67 & 0.67\end{bmatrix}$
image plane at distance 4 in front of viewpoint

24. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 1) in a 613 x 509 image with the following parameters? l=-2, r=1, b=-1, t=1 view type = orthographic
camera origin = $\begin{bmatrix}-5.0 & -1.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.42 & -0.71 & 0.57\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.32 & 0.95 & 0.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.24 & 0.0 & 0.97\end{bmatrix}$

25. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 2) in a 593 x 689 image with the following parameters? l=0, r=1, b=-2, t=3 view type = orthographic
camera origin = $\begin{bmatrix}-5.0 & -4.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.73 & 0.49 & 0.49\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.58 & -0.58 & 0.58\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.0 & 0.45 & -0.89\end{bmatrix}$

26. Ray R has starting point e=$\begin{bmatrix}-21.35 & -3.42 & -1.81\end{bmatrix}$
and direction d=$\begin{bmatrix}0.67 & 0.33 & 0.67\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-5.94 & -7.15 & -0.51\end{bmatrix}$
$\begin{bmatrix}-4.97 & -1.09 & -0.76\end{bmatrix}$
$\begin{bmatrix}-8.85 & 0.12 & 0.21\end{bmatrix}$
$\begin{bmatrix}-8.85 & -0.6 & 0.21\end{bmatrix}$
$\begin{bmatrix}-7.88 & -4.0 & -0.03\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

27. Ray R has starting point e=$\begin{bmatrix}-7.74 & -4.85 & -3.33\end{bmatrix}$
and direction d=$\begin{bmatrix}0.7 & 0.7 & -0.17\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-6.29 & -1.91 & -2.24\end{bmatrix}$
$\begin{bmatrix}-9.64 & -3.74 & -1.93\end{bmatrix}$
$\begin{bmatrix}-0.8 & -1.0 & -6.2\end{bmatrix}$
$\begin{bmatrix}-2.93 & -1.91 & -5.59\end{bmatrix}$
$\begin{bmatrix}-5.52 & -0.54 & -0.71\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?

d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

28. Ray R has starting point e=$\begin{bmatrix}-1.96 & 3.05 & 1.02\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.44 & -0.87 & -0.22\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}0.37 & -0.33 & 4.94\end{bmatrix}$
$\begin{bmatrix}-0.61 & 3.98 & 2.2\end{bmatrix}$
$\begin{bmatrix}1.75 & 1.04 & 6.31\end{bmatrix}$
$\begin{bmatrix}-0.8 & 5.55 & 1.41\end{bmatrix}$
$\begin{bmatrix}-0.41 & 3.59 & 2.59\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

29. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 4) in a 579 x 347 image with the following parameters? l=-5, r=3, b=0, t=1 view type = perspective
camera origin = $\begin{bmatrix}0.0 & -2.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.53 & 0.27 & -0.8\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.27 & -0.8 & 0.53\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.6 & 0.0 & -0.8\end{bmatrix}$
image plane at distance 0 in front of viewpoint

30. Ray R has starting point e=$\begin{bmatrix}-1.93 & 2.93 & -4.6\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.45 & -0.89 & -0.0\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-2.0 & 5.14 & -4.22\end{bmatrix}$
$\begin{bmatrix}-2.39 & 0.82 & -5.0\end{bmatrix}$
$\begin{bmatrix}-4.94 & 1.8 & -2.84\end{bmatrix}$
$\begin{bmatrix}-0.63 & 7.69 & -4.61\end{bmatrix}$
$\begin{bmatrix}-0.63 & 4.55 & -5.39\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

31. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 0) in a 269 x 299 image with the following parameters? l=-4, r=1, b=-4, t=0 view type = perspective
camera origin = $\begin{bmatrix}4.0 & 2.0 & 4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.41 & 0.82 & 0.41\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.85 & 0.17 & -0.51\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.97 & 0.0 & -0.24\end{bmatrix}$
image plane at distance 3 in front of viewpoint

32. Ray R has starting point e=$\begin{bmatrix}-1.49 & -5.75 & -0.25\end{bmatrix}$
and direction d=$\begin{bmatrix}0.71 & -0.0 & 0.71\end{bmatrix}$

. Polygon P has vertices $\begin{bmatrix}4.75 & -4.61 & -8.44\end{bmatrix}$
$\begin{bmatrix}-0.06 & -1.85 & -2.25\end{bmatrix}$
$\begin{bmatrix}0.62 & -1.16 & -6.38\end{bmatrix}$
$\begin{bmatrix}4.75 & -5.98 & -4.31\end{bmatrix}$
$\begin{bmatrix}1.54 & -2.31 & -5.69\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

33. Ray R has starting point e=$\begin{bmatrix}-4.06 & 0.15 & 3.74\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.2 & 0.59 & -0.78\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}3.93 & -0.04 & 0.66\end{bmatrix}$
$\begin{bmatrix}3.19 & -0.97 & -0.09\end{bmatrix}$
$\begin{bmatrix}8.2 & 2.37 & 1.03\end{bmatrix}$
$\begin{bmatrix}1.14 & 1.07 & 4.0\end{bmatrix}$
$\begin{bmatrix}3.56 & 2.56 & 4.37\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

34. Ray R has starting point e=$\begin{bmatrix}-16.3 & 0.19 & 1.0\end{bmatrix}$
and direction d=$\begin{bmatrix}-1.0 & -0.0 & -0.0\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-7.04 & 3.82 & 8.9\end{bmatrix}$
$\begin{bmatrix}-5.41 & 5.04 & 6.86\end{bmatrix}$
$\begin{bmatrix}-6.22 & -0.67 & 2.78\end{bmatrix}$
$\begin{bmatrix}-7.04 & 0.55 & 5.63\end{bmatrix}$
$\begin{bmatrix}-5.41 & 5.04 & 6.86\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

35. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 4) in a 543 x 735 image with the following parameters? l=0, r=2, b=-3, t=-2 view type = perspective
camera origin = $\begin{bmatrix}-5.0 & -4.0 & 2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.62 & 0.62 & -0.47\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.74 & -0.37 & 0.56\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.87 & -0.22 & -0.44\end{bmatrix}$
image plane at distance 3 in front of viewpoint

36. Ray R has starting point e=$\begin{bmatrix}-3.26 & -1.23 & 2.69\end{bmatrix}$

and direction d=$\begin{bmatrix}-0.58 & -0.58 & -0.58\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-4.77 & -2.78 & -4.59\end{bmatrix}$
$\begin{bmatrix}3.58 & 4.24 & -3.53\end{bmatrix}$
$\begin{bmatrix}-3.31 & 0.0 & -5.65\end{bmatrix}$
$\begin{bmatrix}0.93 & -3.71 & 0.71\end{bmatrix}$
$\begin{bmatrix}-0.93 & -4.24 & -0.35\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

37. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 0) in a 614 x 687 image with the following parameters? l=-4, r=0, b=-4, t=0 view type = orthographic
camera origin = $\begin{bmatrix}-5.0 & 1.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.0 & 0.83 & 0.55\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.97 & 0.24 & 0.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.27 & 0.8 & 0.53\end{bmatrix}$

38. Ray R has starting point e=$\begin{bmatrix}-2.46 & -2.34 & -0.85\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.43 & -0.64 & 0.64\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-0.28 & -0.34 & 3.11\end{bmatrix}$
$\begin{bmatrix}-0.28 & -0.34 & 3.11\end{bmatrix}$
$\begin{bmatrix}-1.11 & -5.33 & -0.22\end{bmatrix}$
$\begin{bmatrix}0.28 & 1.33 & 4.22\end{bmatrix}$
$\begin{bmatrix}4.16 & -6.16 & -0.77\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

39. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 2) in a 380 x 371 image with the following parameters? l=0, r=4, b=1, t=2 view type = orthographic
camera origin = $\begin{bmatrix}2.0 & 1.0 & -5.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.71 & 0.0 & -0.71\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & -0.37 & -0.93\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.78 & 0.0 & -0.62\end{bmatrix}$

40. Ray R has starting point e=$\begin{bmatrix}1.42 & -1.49 & 1.0\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.97 & -0.24 & -0.0\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}6.9 & 1.57 & 4.98\end{bmatrix}$
$\begin{bmatrix}2.0 & 0.98 & 4.0\end{bmatrix}$
$\begin{bmatrix}-1.92 & 1.37 & 3.22\end{bmatrix}$
$\begin{bmatrix}1.02 & -5.1 & 3.8\end{bmatrix}$

$\begin{bmatrix}2.0 & -0.59 & 4.0\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

41. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 1) in a 273 x 747 image with the following parameters? l=0, r=1, b=-2, t=0 view type = orthographic
camera origin = $\begin{bmatrix}1.0 & 3.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-1.0 & 0.0 & 0.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.44 & -0.87 & -0.22\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.82 & 0.41 & 0.41\end{bmatrix}$

42. Ray R has starting point e=$\begin{bmatrix}-1.74 & -4.43 & -1.11\end{bmatrix}$
and direction d=$\begin{bmatrix}0.55 & -0.0 & -0.83\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-3.79 & -5.34 & 0.68\end{bmatrix}$
$\begin{bmatrix}-0.66 & -4.45 & -1.11\end{bmatrix}$
$\begin{bmatrix}1.13 & -3.11 & -3.79\end{bmatrix}$
$\begin{bmatrix}-2.0 & -1.76 & -6.47\end{bmatrix}$
$\begin{bmatrix}-1.55 & -5.79 & 1.58\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

43. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 1) in a 290 x 680 image with the following parameters? l=-4, r=-1, b=-5, t=-4 view type = perspective
camera origin = $\begin{bmatrix}1.0 & 0.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.82 & -0.41 & -0.41\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.71 & 0.0 & 0.71\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.94 & 0.24 & 0.24\end{bmatrix}$
image plane at distance 2 in front of viewpoint

44. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 3) in a 543 x 487 image with the following parameters? l=-1, r=0, b=-4, t=-3 view type = perspective
camera origin = $\begin{bmatrix}0.0 & 3.0 & -5.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.57 & -0.42 & -0.71\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.53 & 0.8 & -0.27\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.71 & -0.71 & 0.0\end{bmatrix}$
image plane at distance 4 in front of viewpoint

45. Ray R has starting point e=$\begin{bmatrix}-2.83 & 0.26 & -0.63\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.0 & 1.0 & -0.0\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-4.92 & 3.69 & 0.69\end{bmatrix}$
$\begin{bmatrix}-0.33 & -1.82 & -2.06\end{bmatrix}$

$\begin{bmatrix}-2.39 & 1.62 & -1.15\end{bmatrix}$
$\begin{bmatrix}-2.16 & 9.19 & -3.9\end{bmatrix}$
$\begin{bmatrix}-3.31 & 2.31 & -0.46\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

46. Ray R has starting point e=$\begin{bmatrix}-4.62 & 3.9 & -0.14\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.43 & -0.64 & -0.64\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-3.77 & 5.94 & 0.31\end{bmatrix}$
$\begin{bmatrix}-6.54 & -1.78 & -1.23\end{bmatrix}$
$\begin{bmatrix}-4.85 & 3.62 & -0.46\end{bmatrix}$
$\begin{bmatrix}-4.54 & 2.08 & 0.31\end{bmatrix}$
$\begin{bmatrix}-6.85 & 0.38 & -2.16\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

47. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 0) in a 571 x 489 image with the following parameters? l=-4, r=0, b=0, t=4 view type = perspective
camera origin = $\begin{bmatrix}4.0 & -1.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.41 & -0.41 & -0.82\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.7 & -0.17 & 0.7\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.89 & 0.0 & 0.45\end{bmatrix}$
image plane at distance 2 in front of viewpoint

48. Ray R has starting point e=$\begin{bmatrix}-5.59 & -2.44 & -1.72\end{bmatrix}$
and direction d=$\begin{bmatrix}0.27 & 0.53 & 0.8\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}6.86 & 1.22 & 1.31\end{bmatrix}$
$\begin{bmatrix}1.55 & 1.22 & -4.0\end{bmatrix}$
$\begin{bmatrix}4.82 & -0.82 & -4.82\end{bmatrix}$
$\begin{bmatrix}4.0 & 2.04 & 0.08\end{bmatrix}$
$\begin{bmatrix}1.96 & 2.04 & -1.96\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

49. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 4) in a 299 x 709 image with the following parameters? l=-3, r=-2, b=-4, t=-3 view type = orthographic
camera origin = $\begin{bmatrix}1.0 & -5.0 & 3.0\end{bmatrix}$

camera u axis = $\begin{bmatrix}0.45 & 0.0 & 0.89\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.8 & 0.0 & 0.6\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.41 & 0.41 & 0.82\end{bmatrix}$

50. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 0) in a 262 x 738 image with the following parameters? l=2, r=3, b=-2, t=0 view type = perspective
camera origin = $\begin{bmatrix}-4.0 & 4.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.41 & 0.82 & 0.41\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.46 & 0.46 & -0.76\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.94 & -0.24 & -0.24\end{bmatrix}$
image plane at distance 2 in front of viewpoint

51. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 4) in a 651 x 532 image with the following parameters? l=2, r=3, b=-3, t=2 view type = perspective
camera origin = $\begin{bmatrix}-3.0 & -2.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.59 & -0.78 & 0.2\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.59 & 0.78 & 0.2\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.85 & 0.17 & 0.51\end{bmatrix}$
image plane at distance 3 in front of viewpoint

52. Ray R has starting point e=$\begin{bmatrix}-3.12 & -1.73 & 1.0\end{bmatrix}$
and direction d=$\begin{bmatrix}0.89 & -0.45 & -0.0\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}2.22 & 1.33 & 6.16\end{bmatrix}$
$\begin{bmatrix}1.63 & 2.51 & 7.33\end{bmatrix}$
$\begin{bmatrix}1.63 & -4.55 & 4.98\end{bmatrix}$
$\begin{bmatrix}5.35 & -2.59 & 0.67\end{bmatrix}$
$\begin{bmatrix}5.55 & 2.9 & 2.23\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

53. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 2) in a 720 x 272 image with the following parameters? l=-3, r=2, b=-3, t=2 view type = orthographic
camera origin = $\begin{bmatrix}-2.0 & 4.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.2 & -0.59 & 0.78\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.27 & 0.53 & -0.8\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.2 & 0.78 & -0.59\end{bmatrix}$

54. Ray R has starting point e=$\begin{bmatrix}-2.99 & -1.1 & 0.52\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.39 & 0.65 & 0.65\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}1.8 & -0.6 & 3.6\end{bmatrix}$
$\begin{bmatrix}2.6 & -1.2 & -1.6\end{bmatrix}$
$\begin{bmatrix}-2.2 & 2.4 & 3.8\end{bmatrix}$
$\begin{bmatrix}-2.2 & 2.4 & 5.8\end{bmatrix}$
$\begin{bmatrix}1.8 & -0.6 & 9.0\end{bmatrix}$

.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

55. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 2) in a 301 x 310 image with the following parameters? l=-4, r=1, b=0, t=3 view type = orthographic
camera origin = $\begin{bmatrix}1.0 & 0.0 & 4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.74 & 0.37 & -0.56\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.32 & 0.0 & -0.95\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.78 & -0.59 & 0.2\end{bmatrix}$

56. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 0) in a 267 x 515 image with the following parameters? l=-5, r=-2, b=-5, t=4 view type = perspective
camera origin = $\begin{bmatrix}2.0 & 3.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.0 & -1.0 & 0.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.53 & -0.27 & 0.8\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.41 & 0.82 & 0.41\end{bmatrix}$
image plane at distance 1 in front of viewpoint

57. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 4) in a 462 x 339 image with the following parameters? l=-3, r=-2, b=-1, t=2 view type = perspective
camera origin = $\begin{bmatrix}1.0 & 2.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.33 & -0.67 & -0.67\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.19 & -0.19 & -0.96\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.89 & 0.45 & 0.0\end{bmatrix}$
image plane at distance 3 in front of viewpoint

58. Ray R has starting point e=$\begin{bmatrix}-4.5 & -0.26 & -0.76\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.49 & -0.73 & 0.49\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-5.41 & 1.67 & 1.86\end{bmatrix}$
$\begin{bmatrix}-4.59 & -6.49 & -4.67\end{bmatrix}$
$\begin{bmatrix}-4.18 & -1.18 & 1.45\end{bmatrix}$
$\begin{bmatrix}-5.82 & -4.86 & -5.49\end{bmatrix}$
$\begin{bmatrix}-3.37 & -5.67 & -1.41\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

59. Ray R has starting point e=$\begin{bmatrix}-5.42 & 2.46 & 0.55\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.94 & -0.24 & 0.24\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}1.78 & 3.41 & -1.96\end{bmatrix}$
$\begin{bmatrix}0.55 & 1.78 & -4.0\end{bmatrix}$
$\begin{bmatrix}4.22 & 3.0 & -5.22\end{bmatrix}$

$\begin{bmatrix}2.18 & 0.14 & -8.9\end{bmatrix}$
$\begin{bmatrix}0.96 & 2.18 & -3.59\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

60. Ray R has starting point e=$\begin{bmatrix}-3.98 & -5.0 & 0.98\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.7 & -0.7 & 0.17\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-0.32 & -0.69 & -2.77\end{bmatrix}$
$\begin{bmatrix}1.65 & -4.14 & -4.62\end{bmatrix}$
$\begin{bmatrix}4.23 & -5.74 & -3.38\end{bmatrix}$
$\begin{bmatrix}3.12 & -3.15 & -1.54\end{bmatrix}$
$\begin{bmatrix}3.49 & -3.03 & -0.92\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

61. Ray R has starting point e=$\begin{bmatrix}5.7 & -2.18 & 2.4\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.78 & 0.2 & 0.59\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}3.62 & 0.6 & 4.97\end{bmatrix}$
$\begin{bmatrix}0.38 & -4.11 & 2.7\end{bmatrix}$
$\begin{bmatrix}2.81 & -1.68 & 5.14\end{bmatrix}$
$\begin{bmatrix}2.97 & -1.51 & 5.3\end{bmatrix}$
$\begin{bmatrix}2.16 & -3.78 & 5.46\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

62. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 2) in a 721 x 715 image with the following parameters? l=-5, r=-4, b=3, t=4 view type = orthographic
camera origin = $\begin{bmatrix}4.0 & 4.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.69 & 0.23 & 0.69\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.59 & 0.78 & -0.2\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.8 & 0.0 & 0.6\end{bmatrix}$

63. Ray R has starting point e=$\begin{bmatrix}3.85 & -2.73 & -0.08\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.27 & 0.8 & 0.53\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}1.59 & -2.41 & 2.41\end{bmatrix}$
$\begin{bmatrix}5.83 & -3.12 & -1.83\end{bmatrix}$

$\begin{bmatrix}4.41 & 1.83 & -0.41\end{bmatrix}$
$\begin{bmatrix}1.59 & 0.41 & 2.41\end{bmatrix}$
$\begin{bmatrix}4.41 & 0.41 & -0.41\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

64. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 3) in a 253 x 271 image with the following parameters? l=-4, r=-3, b=-4, t=3 view type = orthographic camera origin = $\begin{bmatrix}3.0 & 1.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.94 & -0.24 & -0.24\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.53 & -0.8 & 0.27\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.62 & -0.62 & -0.47\end{bmatrix}$

65. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 2) in a 510 x 554 image with the following parameters? l=-5, r=2, b=-2, t=3 view type = orthographic camera origin = $\begin{bmatrix}-5.0 & 1.0 & 2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.51 & -0.69 & -0.51\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.62 & -0.62 & 0.47\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.0 & 0.71 & -0.71\end{bmatrix}$

66. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 1) in a 521 x 724 image with the following parameters? l=-1, r=0, b=-3, t=0 view type = orthographic camera origin = $\begin{bmatrix}-3.0 & 0.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.3 & -0.75 & 0.6\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.2 & -0.98 & 0.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.59 & 0.78 & -0.2\end{bmatrix}$

67. Ray R has starting point e=$\begin{bmatrix}-1.71 & -2.36 & 4.3\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.74 & -0.37 & -0.56\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-2.4 & -4.46 & 4.64\end{bmatrix}$
$\begin{bmatrix}-5.37 & 0.74 & -0.74\end{bmatrix}$
$\begin{bmatrix}-3.33 & -2.6 & 2.79\end{bmatrix}$
$\begin{bmatrix}-3.7 & 1.11 & -0.19\end{bmatrix}$
$\begin{bmatrix}-5.74 & 1.49 & -1.49\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

68. Ray R has starting point e=$\begin{bmatrix}-10.96 & -5.99 & 0.97\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.24 & -0.94 & 0.24\end{bmatrix}$

. Polygon P has vertices $\begin{bmatrix}-1.79 & -5.6 & -1.67\end{bmatrix}$
$\begin{bmatrix}-3.66 & -6.14 & -0.6\end{bmatrix}$
$\begin{bmatrix}-4.2 & 0.01 & 1.8\end{bmatrix}$
$\begin{bmatrix}-6.6 & -0.79 & 3.14\end{bmatrix}$
$\begin{bmatrix}0.08 & 1.35 & -0.6\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

69. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 1) in a 648 x 293 image with the following parameters? l=-1, r=2, b=-5, t=-1 view type = perspective
camera origin = $\begin{bmatrix}-3.0 & 0.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.15 & -0.62 & -0.77\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.42 & -0.57 & -0.71\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.41 & -0.41 & -0.82\end{bmatrix}$
image plane at distance 4 in front of viewpoint

70. Ray R has starting point e=$\begin{bmatrix}1.13 & -0.96 & -2.5\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.8 & -0.27 & -0.53\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-0.21 & -1.04 & -2.82\end{bmatrix}$
$\begin{bmatrix}1.14 & -0.87 & -2.65\end{bmatrix}$
$\begin{bmatrix}1.82 & -1.21 & -2.31\end{bmatrix}$
$\begin{bmatrix}-0.38 & 1.15 & -4.17\end{bmatrix}$
$\begin{bmatrix}1.31 & 2.0 & -4.34\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

71. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 2) in a 333 x 404 image with the following parameters? l=3, r=4, b=-3, t=4 view type = orthographic
camera origin = $\begin{bmatrix}-2.0 & 1.0 & -5.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.44 & 0.87 & -0.22\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.27 & -0.8 & 0.53\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.78 & 0.59 & -0.2\end{bmatrix}$

72. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 0) in a 479 x 576 image with the following parameters? l=-4, r=-2, b=-1, t=2 view type = orthographic
camera origin = $\begin{bmatrix}-3.0 & -4.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.75 & 0.6 & -0.3\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.51 & -0.69 & -0.51\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.0 & 0.0 & 1.0\end{bmatrix}$

73. Ray R has starting point e=$\begin{bmatrix}3.45 & -0.26 & 0.74\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.17 & 0.85 & 0.51\end{bmatrix}$ . Polygon P has vertices $\begin{bmatrix}2.37 & 3.39 & 1.96\end{bmatrix}$ $\begin{bmatrix}2.96 & 3.98 & 4.9\end{bmatrix}$ $\begin{bmatrix}2.96 & 2.41 & -2.94\end{bmatrix}$ $\begin{bmatrix}-1.75 & 3.59 & 2.94\end{bmatrix}$ $\begin{bmatrix}-3.12 & 3.39 & 1.96\end{bmatrix}$ .
    b) What is the normal to P?
    c) What is the t intersection point of R and P?
    d) What is the (x, y, z) intersection point on R at t?
    e) Is the intersection point inside the polygon?
    f) Is the intersection point in front of the viewpoint e?

74. Ray R has starting point e=$\begin{bmatrix}-1.16 & -3.8 & -1.04\end{bmatrix}$ and direction d=$\begin{bmatrix}0.59 & 0.78 & 0.2\end{bmatrix}$ . Polygon P has vertices $\begin{bmatrix}-1.71 & -3.65 & -0.89\end{bmatrix}$ $\begin{bmatrix}2.06 & -2.0 & 1.94\end{bmatrix}$ $\begin{bmatrix}3.0 & -2.71 & -1.83\end{bmatrix}$ $\begin{bmatrix}1.11 & -2.71 & 0.06\end{bmatrix}$ $\begin{bmatrix}-1.71 & -2.71 & 2.89\end{bmatrix}$ .
    b) What is the normal to P?
    c) What is the t intersection point of R and P?
    d) What is the (x, y, z) intersection point on R at t?
    e) Is the intersection point inside the polygon?
    f) Is the intersection point in front of the viewpoint e?

75. Ray R has starting point e=$\begin{bmatrix}-16.67 & -4.69 & 0.12\end{bmatrix}$ and direction d=$\begin{bmatrix}0.91 & -0.37 & 0.18\end{bmatrix}$ . Polygon P has vertices $\begin{bmatrix}-0.76 & -3.51 & -5.98\end{bmatrix}$ $\begin{bmatrix}-4.04 & -3.51 & -4.34\end{bmatrix}$ $\begin{bmatrix}-2.4 & -3.81 & -4.79\end{bmatrix}$ $\begin{bmatrix}-1.51 & -4.4 & -4.49\end{bmatrix}$ $\begin{bmatrix}0.43 & -6.49 & -2.85\end{bmatrix}$ .
    b) What is the normal to P?
    c) What is the t intersection point of R and P?
    d) What is the (x, y, z) intersection point on R at t?
    e) Is the intersection point inside the polygon?
    f) Is the intersection point in front of the viewpoint e?

76. Ray R has starting point e=$\begin{bmatrix}-9.23 & 1.3 & 1.58\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.67 & -0.67 & -0.33\end{bmatrix}$ . Polygon P has vertices $\begin{bmatrix}-3.26 & -3.97 & 0.03\end{bmatrix}$ $\begin{bmatrix}-6.97 & 1.23 & 0.4\end{bmatrix}$ $\begin{bmatrix}-4.56 & -0.26 & 3.0\end{bmatrix}$ $\begin{bmatrix}-0.84 & -3.97 & 4.86\end{bmatrix}$ $\begin{bmatrix}-7.71 & 1.97 & 0.03\end{bmatrix}$

.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

77. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 1) in a 349 x 410 image with the following parameters? l=-5, r=-1, b=-4, t=1 view type = perspective
camera origin = $\begin{bmatrix}-4.0 & -5.0 & 2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.87 & 0.44 & 0.22\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.27 & 0.53 & 0.8\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.87 & -0.44 & -0.22\end{bmatrix}$
image plane at distance 0 in front of viewpoint

78. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 4) in a 468 x 311 image with the following parameters? l=-1, r=4, b=-1, t=3 view type = orthographic
camera origin = $\begin{bmatrix}2.0 & -1.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.89 & 0.0 & -0.45\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.22 & -0.87 & 0.44\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.19 & -0.96 & -0.19\end{bmatrix}$

79. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 4) in a 270 x 304 image with the following parameters? l=-1, r=3, b=-5, t=-3 view type = orthographic
camera origin = $\begin{bmatrix}-5.0 & 0.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.91 & -0.37 & 0.18\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.43 & 0.64 & 0.64\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.85 & 0.17 & 0.51\end{bmatrix}$

80. Ray R has starting point e=$\begin{bmatrix}-4.48 & 4.11 & 2.27\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.8 & -0.27 & -0.53\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}1.34 & 4.57 & 4.77\end{bmatrix}$
$\begin{bmatrix}1.34 & -1.09 & -2.77\end{bmatrix}$
$\begin{bmatrix}-3.8 & 4.06 & -1.06\end{bmatrix}$
$\begin{bmatrix}0.66 & 0.46 & -1.4\end{bmatrix}$
$\begin{bmatrix}6.32 & -2.12 & 0.83\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

81. Ray R has starting point e=$\begin{bmatrix}-11.58 & 3.23 & 0.89\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.33 & -0.67 & 0.67\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}0.12 & 4.42 & 2.11\end{bmatrix}$
$\begin{bmatrix}-3.18 & 1.12 & 3.76\end{bmatrix}$
$\begin{bmatrix}-0.82 & 0.65 & 3.29\end{bmatrix}$

$\begin{bmatrix}1.54 & 0.18 & 2.82\end{bmatrix}$
$\begin{bmatrix}-3.89 & 0.89 & 4.0\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

82. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 4) in a 353 x 636 image with the following parameters? l=-5, r=-2, b=-5, t=0 view type = orthographic
camera origin = $\begin{bmatrix}1.0 & 1.0 & -5.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.49 & -0.32 & -0.81\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.62 & 0.15 & -0.77\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.23 & 0.69 & -0.69\end{bmatrix}$

83. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 4) in a 648 x 670 image with the following parameters? l=-2, r=-1, b=1, t=3 view type = perspective
camera origin = $\begin{bmatrix}1.0 & 1.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.6 & 0.0 & 0.8\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.51 & 0.51 & -0.69\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.0 & 0.71 & 0.71\end{bmatrix}$
image plane at distance 3 in front of viewpoint

84. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 2) in a 256 x 716 image with the following parameters? l=-5, r=4, b=-4, t=2 view type = orthographic
camera origin = $\begin{bmatrix}2.0 & 1.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.62 & 0.62 & 0.47\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.95 & -0.32 & 0.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.0 & -0.32 & 0.95\end{bmatrix}$

85. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 3) in a 417 x 453 image with the following parameters? l=-4, r=-2, b=1, t=3 view type = orthographic
camera origin = $\begin{bmatrix}4.0 & 3.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.57 & -0.71 & 0.42\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.74 & 0.56 & -0.37\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.58 & -0.58 & 0.58\end{bmatrix}$

86. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 0) in a 396 x 431 image with the following parameters? l=-4, r=-1, b=-4, t=3 view type = perspective
camera origin = $\begin{bmatrix}-3.0 & -3.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.71 & 0.71 & 0.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.45 & 0.0 & 0.89\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.24 & 0.24 & 0.94\end{bmatrix}$
image plane at distance 0 in front of viewpoint

87. Ray R has starting point e=$\begin{bmatrix}-2.46 & -4.14 & 1.0\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.37 & 0.93 & -0.0\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}3.85 & 1.79 & 1.26\end{bmatrix}$
$\begin{bmatrix}-0.26 & -2.95 & -0.32\end{bmatrix}$
$\begin{bmatrix}1.32 & -4.85 & -0.95\end{bmatrix}$
$\begin{bmatrix}4.16 & -2.95 & -0.32\end{bmatrix}$
$\begin{bmatrix}0.68 & -1.05 & 0.32\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

88. Ray R has starting point e=$\begin{bmatrix}-0.68 & 1.05 & -2.12\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.33 & -0.67 & 0.67\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}3.28 & 2.14 & 2.14\end{bmatrix}$
$\begin{bmatrix}-2.6 & 0.53 & -4.81\end{bmatrix}$
$\begin{bmatrix}-2.6 & -0.27 & -2.41\end{bmatrix}$
$\begin{bmatrix}-0.2 & -0.8 & 4.01\end{bmatrix}$
$\begin{bmatrix}0.6 & 2.94 & -5.61\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

89. Ray R has starting point e=$\begin{bmatrix}-3.14 & 3.04 & 1.23\end{bmatrix}$
and direction d=$\begin{bmatrix}0.6 & -0.3 & 0.75\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}0.49 & 1.51 & 3.24\end{bmatrix}$
$\begin{bmatrix}-4.37 & 3.46 & 5.18\end{bmatrix}$
$\begin{bmatrix}-1.21 & -0.43 & 7.85\end{bmatrix}$
$\begin{bmatrix}2.91 & 0.06 & 3.0\end{bmatrix}$
$\begin{bmatrix}-0.49 & 3.94 & 0.57\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

90. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 4) in a 532 x 542 image with the following parameters? l=-2, r=-1, b=-5, t=0 view type = orthographic
camera origin = $\begin{bmatrix}4.0 & 1.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.9 & -0.3 & -0.3\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.76 & -0.46 & 0.46\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.8 & 0.0 & -0.6\end{bmatrix}$

91. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 1) in a 534 x 345 image with the following parameters? l=0, r=2, b=0, t=1 view type = orthographic camera origin = $\begin{bmatrix}4.0 & 4.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.0 & -0.71 & 0.71\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & 0.89 & 0.45\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.49 & -0.73 & 0.49\end{bmatrix}$

92. Ray R has starting point e=$\begin{bmatrix}-4.58 & -2.45 & -0.82\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.6 & 0.3 & 0.75\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}4.46 & -1.73 & 6.91\end{bmatrix}$
$\begin{bmatrix}1.79 & -1.97 & 7.88\end{bmatrix}$
$\begin{bmatrix}6.64 & -1.97 & 7.88\end{bmatrix}$
$\begin{bmatrix}8.09 & 0.21 & -0.85\end{bmatrix}$
$\begin{bmatrix}4.94 & -1.73 & 6.91\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

93. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 1) in a 570 x 350 image with the following parameters? l=-5, r=0, b=-3, t=-1 view type = orthographic camera origin = $\begin{bmatrix}-3.0 & -2.0 & -5.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.49 & -0.32 & -0.81\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & 0.45 & -0.89\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.6 & -0.75 & 0.3\end{bmatrix}$

94. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 2) in a 404 x 284 image with the following parameters? l=-4, r=-3, b=-5, t=1 view type = orthographic camera origin = $\begin{bmatrix}2.0 & 0.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.69 & 0.51 & 0.51\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.53 & 0.8 & -0.27\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.67 & -0.67 & -0.33\end{bmatrix}$

95. Ray R has starting point e=$\begin{bmatrix}-9.39 & -8.05 & 0.62\end{bmatrix}$
and direction d=$\begin{bmatrix}0.51 & 0.85 & 0.17\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}1.86 & -3.78 & 0.96\end{bmatrix}$
$\begin{bmatrix}-3.04 & -3.78 & 3.41\end{bmatrix}$
$\begin{bmatrix}-5.49 & -2.96 & 4.22\end{bmatrix}$
$\begin{bmatrix}1.86 & -6.22 & 2.18\end{bmatrix}$
$\begin{bmatrix}-4.27 & -0.92 & 2.59\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?

e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

96. Ray R has starting point e=$\begin{bmatrix}0.08 & 4.17 & 1.9\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.87 & 0.22 & -0.44\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}6.12 & 0.29 & -2.97\end{bmatrix}$
$\begin{bmatrix}7.49 & 1.14 & -3.49\end{bmatrix}$
$\begin{bmatrix}1.14 & 5.43 & -6.06\end{bmatrix}$
$\begin{bmatrix}5.6 & 2.86 & -4.51\end{bmatrix}$
$\begin{bmatrix}6.8 & 5.43 & -6.06\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

97. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 3) in a 544 x 644 image with the following parameters? l=-4, r=4, b=-1, t=0 view type = orthographic
camera origin = $\begin{bmatrix}-1.0 & -5.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.33 & 0.67 & 0.67\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.33 & 0.67 & -0.67\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.41 & 0.82 & 0.41\end{bmatrix}$

98. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 1) in a 422 x 443 image with the following parameters? l=-2, r=1, b=-1, t=0 view type = perspective
camera origin = $\begin{bmatrix}0.0 & -2.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.41 & 0.82 & -0.41\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.81 & -0.32 & 0.49\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.33 & -0.67 & -0.67\end{bmatrix}$
image plane at distance 1 in front of viewpoint

99. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 3) in a 647 x 498 image with the following parameters? l=3, r=4, b=2, t=4 view type = perspective
camera origin = $\begin{bmatrix}-2.0 & 4.0 & 4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.24 & 0.94 & -0.24\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.71 & 0.71 & 0.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.67 & 0.33 & 0.67\end{bmatrix}$
image plane at distance 4 in front of viewpoint

100. Ray R has starting point e=$\begin{bmatrix}-4.32 & -1.7 & -1.16\end{bmatrix}$
and direction d=$\begin{bmatrix}0.65 & 0.65 & 0.39\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-0.54 & -2.24 & -8.54\end{bmatrix}$
$\begin{bmatrix}4.41 & 3.41 & -3.59\end{bmatrix}$
$\begin{bmatrix}0.88 & 4.83 & -7.12\end{bmatrix}$
$\begin{bmatrix}4.41 & -2.24 & -3.59\end{bmatrix}$
$\begin{bmatrix}4.41 & -2.24 & -3.59\end{bmatrix}$
.
b) What is the normal to P?

c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

101. Ray R has starting point e=$\begin{bmatrix}-9.45 & 3.06 & -2.76\end{bmatrix}$ and direction d=$\begin{bmatrix}0.15 & -0.62 & 0.77\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}6.4 & 1.03 & 1.24\end{bmatrix}$ $\begin{bmatrix}1.06 & -2.85 & 2.21\end{bmatrix}$ $\begin{bmatrix}3.0 & 2.0 & 1.0\end{bmatrix}$ $\begin{bmatrix}4.21 & -1.88 & 1.97\end{bmatrix}$ $\begin{bmatrix}4.46 & 2.0 & 1.0\end{bmatrix}$.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

102. Ray R has starting point e=$\begin{bmatrix}-1.06 & 2.99 & -0.93\end{bmatrix}$ and direction d=$\begin{bmatrix}0.8 & -0.53 & -0.27\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-1.15 & -0.15 & 2.31\end{bmatrix}$ $\begin{bmatrix}-1.15 & 0.42 & 1.73\end{bmatrix}$ $\begin{bmatrix}0.0 & 5.04 & -4.04\end{bmatrix}$ $\begin{bmatrix}-4.04 & 3.89 & 1.15\end{bmatrix}$ $\begin{bmatrix}-2.89 & 3.31 & 0.58\end{bmatrix}$.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

103. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 1) in a 251 x 406 image with the following parameters? l=-4, r=1, b=-3, t=1 view type = orthographic
camera origin = $\begin{bmatrix}0.0 & 0.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.71 & -0.42 & 0.57\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.78 & -0.59 & -0.2\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.33 & 0.67 & -0.67\end{bmatrix}$

104. Ray R has starting point e=$\begin{bmatrix}-14.72 & -0.29 & -2.09\end{bmatrix}$ and direction d=$\begin{bmatrix}0.56 & 0.37 & 0.74\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-2.85 & -3.34 & 5.52\end{bmatrix}$ $\begin{bmatrix}-0.82 & 0.21 & 0.96\end{bmatrix}$ $\begin{bmatrix}-3.52 & -3.0 & 6.54\end{bmatrix}$ $\begin{bmatrix}-1.15 & 1.9 & 0.96\end{bmatrix}$ $\begin{bmatrix}-4.03 & -2.49 & 7.21\end{bmatrix}$.

b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

105. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 1) in a 548 x 257 image with the following parameters? l=-3, r=3, b=1, t=4 view type = orthographic
camera origin = $\begin{bmatrix}2.0 & -5.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.6 & 0.0 & 0.8\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.82 & 0.41 & 0.41\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.67 & 0.33 & 0.67\end{bmatrix}$

106. Ray R has starting point e=$\begin{bmatrix}-12.81 & -6.88 & 4.62\end{bmatrix}$
and direction d=$\begin{bmatrix}0.53 & 0.66 & -0.53\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}0.93 & -1.63 & -4.19\end{bmatrix}$
$\begin{bmatrix}3.71 & -0.51 & -6.41\end{bmatrix}$
$\begin{bmatrix}-4.64 & -3.86 & -3.44\end{bmatrix}$
$\begin{bmatrix}0.0 & -2.0 & -1.21\end{bmatrix}$
$\begin{bmatrix}1.86 & -1.26 & -5.86\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

107. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 4) in a 423 x 319 image with the following parameters? l=-1, r=2, b=-4, t=1 view type = perspective
camera origin = $\begin{bmatrix}-2.0 & -4.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.64 & 0.64 & -0.43\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.55 & 0.0 & 0.83\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.44 & -0.22 & 0.87\end{bmatrix}$
image plane at distance 1 in front of viewpoint

108. Ray R has starting point e=$\begin{bmatrix}-1.55 & 2.23 & 1.41\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.0 & -1.0 & -0.0\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-0.99 & -4.39 & 3.83\end{bmatrix}$
$\begin{bmatrix}-0.42 & -4.68 & 3.55\end{bmatrix}$
$\begin{bmatrix}-1.84 & 1.69 & 0.86\end{bmatrix}$
$\begin{bmatrix}-0.28 & 1.26 & -0.13\end{bmatrix}$
$\begin{bmatrix}-4.95 & 1.83 & 3.26\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

109. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 1) in a 737 x 711 image with the following parameters? l=-3, r=4, b=-5, t=1 view type = orthographic
camera origin = $\begin{bmatrix}-4.0 & 1.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.94 & -0.24 & -0.24\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & 0.83 & -0.55\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.58 & -0.58 & 0.58\end{bmatrix}$

110. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 4) in a 690 x 541 image with the following parameters? l=-4, r=-1, b=-4, t=-1 view type = perspective
camera origin = $\begin{bmatrix}4.0 & 2.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.39 & -0.65 & -0.65\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.37 & -0.56 & 0.74\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.89 & 0.45 & 0.0\end{bmatrix}$
image plane at distance 0 in front of viewpoint

111. Ray R has starting point e=$\begin{bmatrix}-9.73 & 8.7 & 1.56\end{bmatrix}$
and direction d=$\begin{bmatrix}0.53 & -0.8 & -0.27\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-1.94 & 3.0 & 2.43\end{bmatrix}$
$\begin{bmatrix}-6.57 & -1.63 & -5.29\end{bmatrix}$
$\begin{bmatrix}-5.54 & 8.32 & -3.57\end{bmatrix}$
$\begin{bmatrix}-5.54 & 4.89 & -3.57\end{bmatrix}$
$\begin{bmatrix}-5.03 & 0.08 & -2.71\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

112. Ray R has starting point e=$\begin{bmatrix}-0.94 & -0.44 & -3.37\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.24 & -0.94 & -0.24\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-0.42 & 0.74 & -2.37\end{bmatrix}$
$\begin{bmatrix}-3.26 & -7.79 & -7.11\end{bmatrix}$
$\begin{bmatrix}-0.74 & -0.21 & -2.37\end{bmatrix}$
$\begin{bmatrix}-1.68 & -3.05 & -0.79\end{bmatrix}$
$\begin{bmatrix}-2.63 & -5.9 & -9.01\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

113. Ray R has starting point e=$\begin{bmatrix}0.51 & 1.73 & -7.91\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.0 & -0.45 & 0.89\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}1.0 & 2.46 & -6.92\end{bmatrix}$
$\begin{bmatrix}-0.46 & -1.37 & -6.56\end{bmatrix}$
$\begin{bmatrix}1.0 & -1.01 & 0.02\end{bmatrix}$

$\begin{bmatrix}0.45 & -0.64 & -3.45\end{bmatrix}$
$\begin{bmatrix}1.73 & 3.56 & -5.46\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

114. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 3) in a 537 x 382 image with the following parameters? l=1, r=3, b=-3, t=-1 view type = orthographic
camera origin = $\begin{bmatrix}-4.0 & -2.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.3 & -0.3 & 0.9\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.8 & 0.53 & -0.27\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.49 & 0.49 & 0.73\end{bmatrix}$

115. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 0) in a 341 x 286 image with the following parameters? l=1, r=4, b=1, t=3 view type = orthographic
camera origin = $\begin{bmatrix}-4.0 & 4.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.3 & -0.9 & 0.3\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.41 & -0.41 & 0.82\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.78 & 0.62 & 0.0\end{bmatrix}$

116. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 0) in a 433 x 510 image with the following parameters? l=-1, r=4, b=-3, t=0 view type = perspective
camera origin = $\begin{bmatrix}-5.0 & 1.0 & 4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.49 & -0.73 & -0.49\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.37 & 0.0 & -0.93\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.59 & -0.78 & -0.2\end{bmatrix}$
image plane at distance 1 in front of viewpoint

117. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 1) in a 699 x 613 image with the following parameters? l=1, r=2, b=0, t=3 view type = orthographic
camera origin = $\begin{bmatrix}1.0 & 2.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.37 & -0.74 & -0.56\end{bmatrix}$
camera v axis = $\begin{bmatrix}-1.0 & 0.0 & 0.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.32 & -0.81 & -0.49\end{bmatrix}$

118. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 1) in a 365 x 279 image with the following parameters? l=-2, r=2, b=-2, t=2 view type = orthographic
camera origin = $\begin{bmatrix}3.0 & -3.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.3 & -0.3 & -0.9\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.19 & -0.19 & -0.96\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.41 & -0.41 & -0.82\end{bmatrix}$

119. Ray R has starting point e=$\begin{bmatrix}-5.6 & -3.45 & 1.0\end{bmatrix}$
and direction d=$\begin{bmatrix}0.97 & 0.24 & -0.0\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}3.37 & -3.9 & -2.26\end{bmatrix}$
$\begin{bmatrix}4.0 & -2.0 & -2.9\end{bmatrix}$
$\begin{bmatrix}4.95 & 0.85 & 1.21\end{bmatrix}$
$\begin{bmatrix}3.05 & -4.85 & 0.9\end{bmatrix}$
$\begin{bmatrix}2.74 & -5.79 & -5.74\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

120. Ray R has starting point e=$\begin{bmatrix}-13.19 & -0.14 & 1.0\end{bmatrix}$
and direction d=$\begin{bmatrix}0.71 & 0.71 & -0.0\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-3.25 & -3.06 & 5.09\end{bmatrix}$
$\begin{bmatrix}-4.56 & 4.15 & 1.82\end{bmatrix}$
$\begin{bmatrix}-5.87 & -0.87 & 4.65\end{bmatrix}$
$\begin{bmatrix}-3.69 & 4.58 & 1.38\end{bmatrix}$
$\begin{bmatrix}-5.44 & -2.84 & 5.53\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

121. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 4) in a 459 x 303 image with the following parameters? l=-1, r=1, b=-5, t=2 view type = orthographic
camera origin = $\begin{bmatrix}-1.0 & 0.0 & 4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.19 & -0.19 & -0.96\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & -0.71 & -0.71\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.82 & -0.41 & 0.41\end{bmatrix}$

122. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 4) in a 377 x 675 image with the following parameters? l=1, r=4, b=-5, t=3 view type = perspective
camera origin = $\begin{bmatrix}-2.0 & 3.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.69 & -0.69 & -0.23\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.37 & -0.74 & -0.56\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.53 & -0.66 & -0.53\end{bmatrix}$
image plane at distance 2 in front of viewpoint

123. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 0) in a 648 x 573 image with the following parameters? l=2, r=3, b=-5, t=4 view type = orthographic
camera origin = $\begin{bmatrix}-1.0 & 4.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.87 & 0.44 & -0.22\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.49 & 0.73 & 0.49\end{bmatrix}$

camera w axis = $\begin{bmatrix} -0.33 & -0.67 & 0.67 \end{bmatrix}$

124. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 1) in a 311 x 703 image with the following parameters? l=-3, r=2, b=2, t=4 view type = orthographic
camera origin = $\begin{bmatrix} 3.0 & -5.0 & 4.0 \end{bmatrix}$
camera u axis = $\begin{bmatrix} -0.82 & 0.41 & -0.41 \end{bmatrix}$
camera v axis = $\begin{bmatrix} -0.85 & -0.51 & -0.17 \end{bmatrix}$
camera w axis = $\begin{bmatrix} 0.46 & 0.46 & -0.76 \end{bmatrix}$

125. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 3) in a 615 x 392 image with the following parameters? l=-5, r=-1, b=-1, t=4 view type = orthographic
camera origin = $\begin{bmatrix} 3.0 & 3.0 & 3.0 \end{bmatrix}$
camera u axis = $\begin{bmatrix} 0.0 & -0.51 & -0.86 \end{bmatrix}$
camera v axis = $\begin{bmatrix} 0.23 & 0.69 & 0.69 \end{bmatrix}$
camera w axis = $\begin{bmatrix} -0.62 & -0.77 & 0.15 \end{bmatrix}$

126. Ray R has starting point e=$\begin{bmatrix} -2.65 & 2.14 & 2.21 \end{bmatrix}$
and direction d=$\begin{bmatrix} -0.64 & 0.43 & 0.64 \end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix} -1.25 & 1.69 & 0.48 \end{bmatrix}$
$\begin{bmatrix} -2.85 & 1.69 & 2.08 \end{bmatrix}$
$\begin{bmatrix} -4.23 & 3.06 & 3.92 \end{bmatrix}$
$\begin{bmatrix} -1.48 & -3.82 & -1.13 \end{bmatrix}$
$\begin{bmatrix} -7.21 & -2.44 & 5.06 \end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

127. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 0) in a 452 x 342 image with the following parameters? l=1, r=3, b=2, t=3 view type = perspective
camera origin = $\begin{bmatrix} 2.0 & -4.0 & -5.0 \end{bmatrix}$
camera u axis = $\begin{bmatrix} 0.15 & 0.62 & -0.77 \end{bmatrix}$
camera v axis = $\begin{bmatrix} 0.89 & 0.45 & 0.0 \end{bmatrix}$
camera w axis = $\begin{bmatrix} 0.8 & 0.0 & 0.6 \end{bmatrix}$
image plane at distance 3 in front of viewpoint

128. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 2) in a 316 x 262 image with the following parameters? l=-5, r=-1, b=-2, t=3 view type = perspective
camera origin = $\begin{bmatrix} 0.0 & -3.0 & 2.0 \end{bmatrix}$
camera u axis = $\begin{bmatrix} -0.41 & 0.82 & 0.41 \end{bmatrix}$
camera v axis = $\begin{bmatrix} -0.75 & -0.6 & -0.3 \end{bmatrix}$
camera w axis = $\begin{bmatrix} -0.46 & -0.76 & 0.46 \end{bmatrix}$
image plane at distance 2 in front of viewpoint

129. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 4) in a 526 x 618 image with the following parameters? l=-3, r=4, b=0, t=4 view type = perspective
camera origin = $\begin{bmatrix}1.0 & -1.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.23 & -0.69 & 0.69\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.98 & 0.2 & 0.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.82 & 0.41 & -0.41\end{bmatrix}$
image plane at distance 0 in front of viewpoint

130. Ray R has starting point e=$\begin{bmatrix}-8.1 & -2.67 & 1.49\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.9 & -0.3 & -0.3\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-3.59 & -1.87 & -1.0\end{bmatrix}$
$\begin{bmatrix}-0.94 & 0.62 & 3.53\end{bmatrix}$
$\begin{bmatrix}-7.97 & -1.87 & -5.37\end{bmatrix}$
$\begin{bmatrix}-2.81 & 0.62 & 1.65\end{bmatrix}$
$\begin{bmatrix}-5.31 & -4.37 & -4.59\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

131. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 4) in a 499 x 434 image with the following parameters? l=-5, r=0, b=1, t=4 view type = perspective
camera origin = $\begin{bmatrix}-3.0 & -1.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.0 & 0.71 & -0.71\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.15 & -0.62 & -0.77\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.8 & 0.53 & 0.27\end{bmatrix}$
image plane at distance 4 in front of viewpoint

132. Ray R has starting point e=$\begin{bmatrix}2.26 & -2.33 & -5.55\end{bmatrix}$
and direction d=$\begin{bmatrix}0.27 & 0.53 & 0.8\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}2.49 & -1.86 & -4.8\end{bmatrix}$
$\begin{bmatrix}3.0 & -1.0 & 2.23\end{bmatrix}$
$\begin{bmatrix}2.49 & -1.86 & -6.0\end{bmatrix}$
$\begin{bmatrix}4.54 & 1.57 & 3.43\end{bmatrix}$
$\begin{bmatrix}2.49 & -1.86 & 2.57\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

133. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 0) in a 421 x 401 image with the following parameters? l=-5, r=-2, b=0, t=4 view type = orthographic
camera origin = $\begin{bmatrix}3.0 & -2.0 & -5.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.27 & -0.53 & 0.8\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.7 & -0.14 & -0.7\end{bmatrix}$

camera w axis = $\begin{bmatrix}1.0 & 0.0 & 0.0\end{bmatrix}$

134. Ray R has starting point e=$\begin{bmatrix}-10.71 & 6.47 & 1.0\end{bmatrix}$
and direction d=$\begin{bmatrix}0.83 & -0.55 & -0.0\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-0.11 & 4.45 & -3.26\end{bmatrix}$
$\begin{bmatrix}-3.68 & 2.66 & 4.79\end{bmatrix}$
$\begin{bmatrix}-0.11 & 4.45 & -1.92\end{bmatrix}$
$\begin{bmatrix}1.68 & 5.34 & 6.13\end{bmatrix}$
$\begin{bmatrix}3.47 & 6.24 & -3.71\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

135. Ray R has starting point e=$\begin{bmatrix}-4.6 & -5.09 & 1.52\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.35 & 0.87 & -0.35\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}2.12 & -4.12 & 3.12\end{bmatrix}$
$\begin{bmatrix}3.54 & -4.12 & 4.54\end{bmatrix}$
$\begin{bmatrix}0.71 & -1.29 & 1.71\end{bmatrix}$
$\begin{bmatrix}1.41 & -2.71 & 2.41\end{bmatrix}$
$\begin{bmatrix}0.0 & -2.0 & 1.0\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

136. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 1) in a 541 x 364 image with the following parameters? l=-5, r=-4, b=0, t=2 view type = orthographic
camera origin = $\begin{bmatrix}1.0 & -2.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.53 & 0.27 & 0.8\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.23 & 0.69 & -0.69\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.62 & 0.0 & -0.78\end{bmatrix}$

137. Ray R has starting point e=$\begin{bmatrix}-1.31 & -0.46 & 0.15\end{bmatrix}$
and direction d=$\begin{bmatrix}0.6 & -0.3 & 0.75\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}0.33 & -6.0 & 1.67\end{bmatrix}$
$\begin{bmatrix}2.0 & 0.67 & 3.33\end{bmatrix}$
$\begin{bmatrix}3.0 & -2.0 & 1.0\end{bmatrix}$
$\begin{bmatrix}0.67 & -4.0 & 2.33\end{bmatrix}$
$\begin{bmatrix}1.0 & -0.67 & 3.67\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?

d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

138. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 1) in a 539 x 505 image with the following parameters? l=2, r=4, b=2, t=3 view type = perspective
camera origin = $\begin{bmatrix}2.0 & 0.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.59 & 0.2 & 0.78\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.2 & 0.78 & 0.59\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.46 & -0.76 & 0.46\end{bmatrix}$
image plane at distance 4 in front of viewpoint

139. Ray R has starting point e=$\begin{bmatrix}1.82 & 2.32 & -8.49\end{bmatrix}$
and direction d=$\begin{bmatrix}0.77 & -0.15 & 0.62\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}2.64 & 1.28 & -6.49\end{bmatrix}$
$\begin{bmatrix}3.71 & 2.56 & -8.41\end{bmatrix}$
$\begin{bmatrix}0.93 & 1.28 & -4.79\end{bmatrix}$
$\begin{bmatrix}5.2 & -2.56 & -6.49\end{bmatrix}$
$\begin{bmatrix}0.72 & -1.28 & -2.87\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

140. Ray R has starting point e=$\begin{bmatrix}3.96 & -0.58 & -5.1\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.71 & 0.71 & -0.0\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}5.41 & 4.12 & -2.59\end{bmatrix}$
$\begin{bmatrix}1.88 & -2.95 & -6.12\end{bmatrix}$
$\begin{bmatrix}3.29 & 5.54 & -4.71\end{bmatrix}$
$\begin{bmatrix}6.83 & -0.12 & -1.17\end{bmatrix}$
$\begin{bmatrix}2.59 & 2.0 & -5.41\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

141. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 3) in a 502 x 566 image with the following parameters? l=-4, r=3, b=0, t=2 view type = orthographic
camera origin = $\begin{bmatrix}-5.0 & -4.0 & 0.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.74 & 0.56 & 0.37\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.71 & -0.71 & 0.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}1.0 & 0.0 & 0.0\end{bmatrix}$

142. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 0) in a 250 x 533 image with the following parameters? l=-5, r=2, b=-1, t=3 view type = orthographic

camera origin = $\begin{bmatrix}1.0 & 3.0 & -5.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.33 & -0.67 & 0.67\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.7 & -0.7 & 0.14\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.6 & 0.0 & 0.8\end{bmatrix}$

143. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 2) in a 272 x 513 image with the following parameters? l=1, r=4, b=-2, t=4 view type = orthographic
camera origin = $\begin{bmatrix}-5.0 & 4.0 & 0.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.23 & 0.69 & 0.69\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.27 & -0.68 & -0.68\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.71 & -0.71 & 0.0\end{bmatrix}$

144. Ray R has starting point e=$\begin{bmatrix}-2.62 & 0.64 & 1.4\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.56 & -0.74 & -0.37\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-4.14 & -1.41 & 0.6\end{bmatrix}$
$\begin{bmatrix}-2.8 & 0.47 & 0.34\end{bmatrix}$
$\begin{bmatrix}-1.2 & 0.73 & -3.94\end{bmatrix}$
$\begin{bmatrix}-3.07 & 1.8 & 3.81\end{bmatrix}$
$\begin{bmatrix}-3.87 & -0.07 & 2.47\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

145. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 0) in a 654 x 710 image with the following parameters? l=-1, r=1, b=-2, t=0 view type = orthographic
camera origin = $\begin{bmatrix}4.0 & 1.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.23 & -0.69 & 0.69\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.53 & -0.27 & -0.8\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.67 & -0.33 & -0.67\end{bmatrix}$

146. Ray R has starting point e=$\begin{bmatrix}-5.26 & 2.41 & -5.65\end{bmatrix}$
and direction d=$\begin{bmatrix}0.53 & 0.66 & 0.53\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-5.2 & 4.07 & -0.77\end{bmatrix}$
$\begin{bmatrix}-5.7 & 1.87 & -9.9\end{bmatrix}$
$\begin{bmatrix}-4.86 & 2.04 & -5.17\end{bmatrix}$
$\begin{bmatrix}-4.18 & 0.86 & -5.34\end{bmatrix}$
$\begin{bmatrix}-4.18 & 2.21 & -1.28\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

147. Ray R has starting point e=$\begin{bmatrix}-8.73 & -2.02 & 2.24\end{bmatrix}$
and direction d=$\begin{bmatrix}0.23 & 0.69 & -0.69\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-4.22 & 4.77 & 6.16\end{bmatrix}$
$\begin{bmatrix}-6.44 & 3.11 & 3.66\end{bmatrix}$
$\begin{bmatrix}-8.38 & -0.22 & -1.33\end{bmatrix}$
$\begin{bmatrix}-3.94 & 2.0 & 2.0\end{bmatrix}$
$\begin{bmatrix}-3.11 & 1.45 & 1.17\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

148. Ray R has starting point e=$\begin{bmatrix}-11.91 & 1.98 & 1.74\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.78 & -0.2 & -0.59\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-4.37 & 1.37 & -4.37\end{bmatrix}$
$\begin{bmatrix}-3.2 & 1.18 & -7.12\end{bmatrix}$
$\begin{bmatrix}-1.43 & -0.98 & -3.78\end{bmatrix}$
$\begin{bmatrix}-6.92 & 2.16 & 0.14\end{bmatrix}$
$\begin{bmatrix}-5.94 & 0.98 & 1.9\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

149. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 0) in a 285 x 554 image with the following parameters? l=0, r=3, b=-4, t=-1 view type = perspective
camera origin = $\begin{bmatrix}0.0 & -3.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.62 & 0.15 & -0.77\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.69 & -0.51 & 0.51\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.24 & -0.24 & 0.94\end{bmatrix}$
image plane at distance 4 in front of viewpoint

150. Ray R has starting point e=$\begin{bmatrix}-2.37 & -2.09 & -3.5\end{bmatrix}$
and direction d=$\begin{bmatrix}0.85 & -0.17 & 0.51\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-1.0 & 1.03 & -4.03\end{bmatrix}$
$\begin{bmatrix}0.87 & -3.5 & -0.91\end{bmatrix}$
$\begin{bmatrix}4.0 & -1.0 & -5.75\end{bmatrix}$
$\begin{bmatrix}-2.87 & 0.72 & -2.31\end{bmatrix}$
$\begin{bmatrix}-2.87 & -1.78 & 0.19\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

151. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 2) in a 496 x 598 image with the following parameters? l=0, r=3, b=-5, t=-2 view type = orthographic camera origin = $\begin{bmatrix}-5.0 & -4.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.3 & -0.9 & 0.3\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.71 & 0.0 & -0.71\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.96 & -0.19 & 0.19\end{bmatrix}$

152. Ray R has starting point e=$\begin{bmatrix}-1.67 & -4.32 & 4.22\end{bmatrix}$
and direction d=$\begin{bmatrix}0.67 & -0.33 & -0.67\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-2.32 & -2.89 & 2.65\end{bmatrix}$
$\begin{bmatrix}1.73 & -6.14 & 3.78\end{bmatrix}$
$\begin{bmatrix}-4.11 & -3.05 & 1.51\end{bmatrix}$
$\begin{bmatrix}-5.24 & -9.06 & -1.57\end{bmatrix}$
$\begin{bmatrix}-1.84 & -1.59 & 3.46\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

153. Ray R has starting point e=$\begin{bmatrix}-5.85 & 4.2 & -1.17\end{bmatrix}$
and direction d=$\begin{bmatrix}0.45 & -0.0 & 0.89\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}4.16 & -1.7 & 0.61\end{bmatrix}$
$\begin{bmatrix}8.17 & 1.23 & 2.15\end{bmatrix}$
$\begin{bmatrix}3.08 & 4.78 & 6.01\end{bmatrix}$
$\begin{bmatrix}-0.47 & 2.15 & 4.62\end{bmatrix}$
$\begin{bmatrix}7.4 & 2.0 & 2.92\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

154. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 4) in a 729 x 527 image with the following parameters? l=-5, r=0, b=-2, t=0 view type = perspective camera origin = $\begin{bmatrix}4.0 & -2.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.69 & -0.69 & 0.23\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.37 & 0.74 & -0.56\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.67 & -0.67 & 0.33\end{bmatrix}$
image plane at distance 2 in front of viewpoint

155. Ray R has starting point e=$\begin{bmatrix}-11.94 & -1.73 & 2.77\end{bmatrix}$
and direction d=$\begin{bmatrix}0.33 & 0.67 & -0.67\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}2.11 & -1.13 & -5.26\end{bmatrix}$
$\begin{bmatrix}1.83 & -0.99 & -5.12\end{bmatrix}$
$\begin{bmatrix}-1.85 & -0.42 & -1.16\end{bmatrix}$

$\begin{bmatrix}0.27 & 0.42 & -5.4\end{bmatrix}$
$\begin{bmatrix}-5.1 & 0.14 & 2.23\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

156. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 3) in a 511 x 554 image with the following parameters? l=2, r=4, b=-3, t=4 view type = perspective camera origin = $\begin{bmatrix}-1.0 & -4.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.78 & 0.59 & -0.2\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.41 & -0.82 & -0.41\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.82 & 0.41 & -0.41\end{bmatrix}$
image plane at distance 0 in front of viewpoint

157. Ray R has starting point e=$\begin{bmatrix}-10.16 & -0.2 & 2.75\end{bmatrix}$
and direction d=$\begin{bmatrix}0.2 & -0.78 & -0.59\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-0.12 & -0.24 & -5.47\end{bmatrix}$
$\begin{bmatrix}1.06 & -1.89 & -4.76\end{bmatrix}$
$\begin{bmatrix}0.11 & 3.77 & -6.41\end{bmatrix}$
$\begin{bmatrix}-1.54 & 2.12 & -6.41\end{bmatrix}$
$\begin{bmatrix}3.18 & -3.54 & -3.82\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

158. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 1) in a 666 x 276 image with the following parameters? l=-5, r=0, b=-3, t=4 view type = perspective camera origin = $\begin{bmatrix}1.0 & -5.0 & 0.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.95 & 0.0 & -0.32\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.3 & -0.75 & 0.6\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.0 & -0.89 & -0.45\end{bmatrix}$
image plane at distance 4 in front of viewpoint

159. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 4) in a 509 x 459 image with the following parameters? l=-4, r=1, b=-3, t=4 view type = orthographic camera origin = $\begin{bmatrix}-2.0 & -4.0 & 4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.71 & 0.0 & -0.71\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & -0.95 & -0.32\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.51 & 0.69 & -0.51\end{bmatrix}$

160. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 3) in a 682 x 445 image with the following parameters? l=-5, r=-1, b=-5, t=3 view type = orthographic camera origin = $\begin{bmatrix}2.0 & -4.0 & -2.0\end{bmatrix}$

camera u axis = $\begin{bmatrix}-0.97 & 0.0 & 0.24\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.53 & 0.8 & 0.27\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.97 & 0.0 & 0.24\end{bmatrix}$

161. Ray R has starting point e=$\begin{bmatrix}-5.52 & 2.83 & 0.73\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.24 & -0.94 & 0.24\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-3.1 & -0.38 & 1.16\end{bmatrix}$
$\begin{bmatrix}0.72 & 3.15 & 3.28\end{bmatrix}$
$\begin{bmatrix}-1.83 & 1.17 & 1.59\end{bmatrix}$
$\begin{bmatrix}1.42 & 5.84 & 2.15\end{bmatrix}$
$\begin{bmatrix}-3.53 & 2.3 & -1.38\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

162. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 3) in a 425 x 649 image with the following parameters? l=-5, r=4, b=1, t=4 view type = orthographic
camera origin = $\begin{bmatrix}1.0 & -4.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.53 & 0.27 & 0.8\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.35 & 0.35 & -0.87\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.49 & 0.73 & 0.49\end{bmatrix}$

163. Ray R has starting point e=$\begin{bmatrix}-5.64 & -3.7 & 0.38\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.8 & -0.53 & 0.27\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}5.43 & -5.06 & 6.77\end{bmatrix}$
$\begin{bmatrix}-0.57 & -1.46 & 3.86\end{bmatrix}$
$\begin{bmatrix}-0.57 & -1.46 & 3.17\end{bmatrix}$
$\begin{bmatrix}0.29 & -1.97 & 6.26\end{bmatrix}$
$\begin{bmatrix}1.14 & -2.49 & 1.8\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

164. Ray R has starting point e=$\begin{bmatrix}-1.42 & 1.48 & 0.05\end{bmatrix}$
and direction d=$\begin{bmatrix}0.44 & 0.22 & -0.87\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}0.21 & 2.58 & -2.45\end{bmatrix}$
$\begin{bmatrix}2.0 & -1.0 & -1.11\end{bmatrix}$
$\begin{bmatrix}0.21 & 2.58 & -6.47\end{bmatrix}$
$\begin{bmatrix}2.89 & -2.79 & -0.21\end{bmatrix}$
$\begin{bmatrix}2.89 & -2.79 & 1.13\end{bmatrix}$
.

b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

165. Ray R has starting point e=$\begin{bmatrix}-9.06 & 0.98 & 6.91\end{bmatrix}$
and direction d=$\begin{bmatrix}0.71 & -0.0 & -0.71\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-7.3 & 2.12 & 4.77\end{bmatrix}$
$\begin{bmatrix}-4.55 & -3.77 & 1.04\end{bmatrix}$
$\begin{bmatrix}-4.75 & 0.75 & 4.37\end{bmatrix}$
$\begin{bmatrix}-2.2 & 0.16 & 4.57\end{bmatrix}$
$\begin{bmatrix}-1.02 & -4.94 & 1.04\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

166. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 2) in a 670 x 728 image with the following parameters? l=1, r=3, b=-3, t=0 view type = orthographic
camera origin = $\begin{bmatrix}-5.0 & -5.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.59 & -0.78 & -0.2\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.71 & 0.71 & 0.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.33 & -0.67 & 0.67\end{bmatrix}$

167. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 1) in a 487 x 533 image with the following parameters? l=0, r=2, b=-1, t=4 view type = perspective
camera origin = $\begin{bmatrix}0.0 & 3.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.24 & -0.24 & 0.94\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.8 & 0.6 & 0.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.64 & -0.43 & -0.64\end{bmatrix}$
image plane at distance 3 in front of viewpoint

168. Ray R has starting point e=$\begin{bmatrix}-1.31 & -0.03 & 6.99\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.56 & -0.37 & -0.74\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-6.94 & 3.54 & 6.14\end{bmatrix}$
$\begin{bmatrix}-4.8 & -3.41 & 6.41\end{bmatrix}$
$\begin{bmatrix}-3.47 & -1.53 & 3.47\end{bmatrix}$
$\begin{bmatrix}-6.67 & 0.6 & 7.21\end{bmatrix}$
$\begin{bmatrix}-5.6 & -1.0 & 6.41\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

169. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 4) in a 552 x 547 image with the following parameters? l=-3, r=4, b=-1, t=3 view type = orthographic
camera origin = $\begin{bmatrix}3.0 & -5.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.37 & -0.74 & 0.56\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.45 & 0.89 & 0.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.8 & 0.27 & -0.53\end{bmatrix}$

170. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 1) in a 640 x 563 image with the following parameters? l=-1, r=1, b=-1, t=3 view type = orthographic
camera origin = $\begin{bmatrix}1.0 & -2.0 & 2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.53 & 0.8 & -0.27\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.58 & 0.58 & 0.58\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.58 & -0.58 & -0.58\end{bmatrix}$

171. Ray R has starting point e=$\begin{bmatrix}-5.19 & 4.21 & 1.25\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.0 & 0.71 & -0.71\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-4.64 & -0.37 & 7.35\end{bmatrix}$
$\begin{bmatrix}0.85 & 0.54 & 3.39\end{bmatrix}$
$\begin{bmatrix}0.85 & 0.54 & 3.39\end{bmatrix}$
$\begin{bmatrix}5.88 & 4.66 & 5.22\end{bmatrix}$
$\begin{bmatrix}-3.12 & 1.91 & 9.64\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

172. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 2) in a 321 x 686 image with the following parameters? l=-5, r=-3, b=-3, t=-2 view type = orthographic
camera origin = $\begin{bmatrix}-2.0 & -1.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.8 & -0.53 & 0.27\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.71 & 0.42 & 0.57\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.15 & -0.77 & 0.62\end{bmatrix}$

173. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 0) in a 604 x 627 image with the following parameters? l=-2, r=3, b=-5, t=4 view type = orthographic
camera origin = $\begin{bmatrix}-4.0 & 0.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.0 & -0.37 & -0.93\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.24 & 0.0 & -0.97\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.33 & -0.67 & 0.67\end{bmatrix}$

174. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 1) in a 593 x 734 image with the following parameters? l=-3, r=4, b=0, t=4 view type = perspective
camera origin = $\begin{bmatrix}0.0 & -5.0 & 2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.22 & -0.44 & 0.87\end{bmatrix}$

camera v axis = $\begin{bmatrix}-0.49 & 0.49 & -0.73\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.87 & 0.44 & -0.22\end{bmatrix}$
image plane at distance 2 in front of viewpoint

175. Ray R has starting point e=$\begin{bmatrix}-10.02 & -8.72 & 0.01\end{bmatrix}$
and direction d=$\begin{bmatrix}0.51 & 0.85 & 0.17\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-0.66 & -1.94 & 1.3\end{bmatrix}$
$\begin{bmatrix}-4.39 & 0.3 & -0.79\end{bmatrix}$
$\begin{bmatrix}-5.13 & 0.3 & -1.39\end{bmatrix}$
$\begin{bmatrix}2.32 & -2.68 & 3.39\end{bmatrix}$
$\begin{bmatrix}-2.75 & -5.22 & -1.68\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

176. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 0) in a 507 x 545 image with the following parameters? l=-2, r=-1, b=0, t=3 view type = orthographic
camera origin = $\begin{bmatrix}-4.0 & 1.0 & 4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.41 & 0.82 & 0.41\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.89 & 0.45 & 0.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.2 & -0.98 & 0.0\end{bmatrix}$

177. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 3) in a 495 x 510 image with the following parameters? l=-5, r=3, b=-4, t=-1 view type = orthographic
camera origin = $\begin{bmatrix}-3.0 & 0.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.42 & -0.57 & -0.71\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.59 & 0.2 & -0.78\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.97 & 0.24 & 0.0\end{bmatrix}$

178. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 2) in a 602 x 557 image with the following parameters? l=-3, r=3, b=-5, t=4 view type = perspective
camera origin = $\begin{bmatrix}-5.0 & -4.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.58 & -0.58 & 0.58\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & 0.83 & -0.55\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.56 & 0.37 & 0.74\end{bmatrix}$
image plane at distance 0 in front of viewpoint

179. Ray R has starting point e=$\begin{bmatrix}-7.63 & 2.04 & 0.5\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.0 & 0.45 & 0.89\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}0.85 & 0.05 & 1.21\end{bmatrix}$
$\begin{bmatrix}-2.0 & 1.0 & -2.26\end{bmatrix}$
$\begin{bmatrix}-1.05 & 0.68 & 2.48\end{bmatrix}$
$\begin{bmatrix}-1.05 & 0.68 & -1.0\end{bmatrix}$
$\begin{bmatrix}-6.74 & 2.58 & -1.32\end{bmatrix}$
.

b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

180. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 3) in a 696 x 746 image with the following parameters? l=-2, r=-1, b=-1, t=1 view type = orthographic
camera origin = $\begin{bmatrix}-4.0 & -4.0 & 4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.33 & 0.67 & -0.67\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.89 & 0.0 & -0.45\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.43 & 0.64 & 0.64\end{bmatrix}$

181. Ray R has starting point e=$\begin{bmatrix}2.92 & -2.41 & -1.18\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.41 & -0.41 & -0.82\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}1.97 & -1.88 & -3.37\end{bmatrix}$
$\begin{bmatrix}1.19 & -6.25 & -0.87\end{bmatrix}$
$\begin{bmatrix}6.81 & -6.25 & 4.75\end{bmatrix}$
$\begin{bmatrix}2.59 & -7.5 & 1.47\end{bmatrix}$
$\begin{bmatrix}2.13 & -5.62 & -0.41\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

182. Ray R has starting point e=$\begin{bmatrix}-7.2 & 1.53 & 3.66\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.43 & -0.64 & -0.64\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-6.03 & -0.99 & -1.99\end{bmatrix}$
$\begin{bmatrix}-6.7 & -4.03 & -0.97\end{bmatrix}$
$\begin{bmatrix}-3.66 & -6.39 & -2.32\end{bmatrix}$
$\begin{bmatrix}-0.96 & -1.83 & -4.86\end{bmatrix}$
$\begin{bmatrix}-1.3 & 0.03 & -5.03\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

183. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 2) in a 363 x 570 image with the following parameters? l=-2, r=2, b=3, t=4 view type = perspective
camera origin = $\begin{bmatrix}4.0 & 0.0 & 4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.43 & -0.64 & 0.64\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.96 & -0.19 & 0.19\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.58 & 0.58 & 0.58\end{bmatrix}$
image plane at distance 0 in front of viewpoint

184. Ray R has starting point e=$\begin{bmatrix}-6.76 & 1.91 & -1.9\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.0 & -0.8 & 0.6\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-9.64 & -0.54 & 1.88\end{bmatrix}$
$\begin{bmatrix}-4.91 & 0.37 & -4.37\end{bmatrix}$
$\begin{bmatrix}-3.54 & -3.74 & 1.12\end{bmatrix}$
$\begin{bmatrix}-2.17 & -1.91 & -3.3\end{bmatrix}$
$\begin{bmatrix}-3.24 & -1.46 & -3.0\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

185. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 3) in a 684 x 483 image with the following parameters? l=-5, r=-1, b=-3, t=2 view type = perspective
camera origin = $\begin{bmatrix}-3.0 & 1.0 & 2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.24 & -0.24 & 0.94\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & -0.32 & 0.95\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.67 & 0.67 & -0.33\end{bmatrix}$
image plane at distance 1 in front of viewpoint

186. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 1) in a 482 x 419 image with the following parameters? l=0, r=3, b=-1, t=3 view type = perspective
camera origin = $\begin{bmatrix}1.0 & 4.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.67 & -0.33 & 0.67\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.67 & -0.67 & 0.33\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.83 & 0.0 & 0.55\end{bmatrix}$
image plane at distance 2 in front of viewpoint

187. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 1) in a 712 x 712 image with the following parameters? l=-2, r=4, b=1, t=3 view type = orthographic
camera origin = $\begin{bmatrix}3.0 & 2.0 & 2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.85 & -0.51 & -0.17\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.56 & 0.37 & -0.74\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.51 & -0.85 & -0.17\end{bmatrix}$

188. Ray R has starting point e=$\begin{bmatrix}4.65 & 4.96 & 0.88\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.62 & -0.62 & -0.47\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}2.46 & 3.8 & 2.74\end{bmatrix}$
$\begin{bmatrix}-0.12 & 1.4 & -3.09\end{bmatrix}$
$\begin{bmatrix}3.49 & -3.06 & -2.74\end{bmatrix}$
$\begin{bmatrix}-0.12 & 3.97 & -0.51\end{bmatrix}$
$\begin{bmatrix}2.97 & -1.0 & -1.37\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?

e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

189. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 1) in a 543 x 329 image with the following parameters? l=-1, r=2, b=-2, t=-1 view type = perspective
camera origin = $\begin{bmatrix}-2.0 & -5.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.0 & 0.0 & -1.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.37 & 0.74 & 0.56\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.74 & -0.56 & -0.37\end{bmatrix}$
image plane at distance 2 in front of viewpoint

190. Ray R has starting point e=$\begin{bmatrix}-7.73 & 2.48 & -2.01\end{bmatrix}$
and direction d=$\begin{bmatrix}0.91 & -0.18 & 0.37\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-5.93 & 1.22 & 0.55\end{bmatrix}$
$\begin{bmatrix}-1.46 & 6.93 & 1.01\end{bmatrix}$
$\begin{bmatrix}-5.31 & 1.38 & -1.92\end{bmatrix}$
$\begin{bmatrix}-0.38 & 6.16 & -7.47\end{bmatrix}$
$\begin{bmatrix}-1.15 & 6.47 & -2.38\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

191. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 2) in a 263 x 315 image with the following parameters? l=-5, r=2, b=-2, t=1 view type = orthographic
camera origin = $\begin{bmatrix}-5.0 & -3.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.67 & -0.33 & -0.67\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.35 & -0.87 & -0.35\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.24 & 0.0 & -0.97\end{bmatrix}$

192. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 0) in a 669 x 646 image with the following parameters? l=1, r=2, b=-4, t=-2 view type = orthographic
camera origin = $\begin{bmatrix}-1.0 & 1.0 & 2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.44 & 0.22 & -0.87\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.32 & 0.0 & -0.95\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.44 & -0.87 & -0.22\end{bmatrix}$

193. Ray R has starting point e=$\begin{bmatrix}-3.61 & -6.36 & 3.58\end{bmatrix}$
and direction d=$\begin{bmatrix}0.42 & 0.71 & -0.57\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}3.63 & -0.1 & 0.42\end{bmatrix}$
$\begin{bmatrix}2.05 & -4.85 & 2.0\end{bmatrix}$
$\begin{bmatrix}2.05 & -4.85 & 2.32\end{bmatrix}$
$\begin{bmatrix}2.05 & -4.85 & -1.48\end{bmatrix}$
$\begin{bmatrix}4.58 & 2.74 & -1.48\end{bmatrix}$
.
b) What is the normal to P?

c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

194. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 0) in a 648 x 669 image with the following parameters? l=-2, r=4, b=2, t=3 view type = orthographic
camera origin = $\begin{bmatrix}-5.0 & -4.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.27 & -0.8 & -0.53\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.24 & -0.94 & 0.24\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.75 & 0.6 & -0.3\end{bmatrix}$

195. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 2) in a 297 x 564 image with the following parameters? l=-4, r=0, b=0, t=1 view type = perspective
camera origin = $\begin{bmatrix}-2.0 & -1.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.39 & -0.65 & -0.65\end{bmatrix}$
camera v axis = $\begin{bmatrix}1.0 & 0.0 & 0.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.0 & -0.24 & 0.97\end{bmatrix}$
image plane at distance 0 in front of viewpoint

196. Ray R has starting point e=$\begin{bmatrix}-4.67 & -3.32 & 3.75\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.49 & 0.81 & 0.32\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-8.0 & -1.67 & 6.33\end{bmatrix}$
$\begin{bmatrix}-2.33 & -2.33 & 1.0\end{bmatrix}$
$\begin{bmatrix}-3.0 & -6.33 & 3.67\end{bmatrix}$
$\begin{bmatrix}-4.33 & -5.67 & 4.67\end{bmatrix}$
$\begin{bmatrix}-1.67 & -8.33 & 3.33\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

197. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 3) in a 656 x 282 image with the following parameters? l=-3, r=-2, b=-3, t=0 view type = perspective
camera origin = $\begin{bmatrix}-1.0 & -4.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.3 & -0.3 & -0.9\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.59 & 0.78 & -0.2\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.49 & 0.49 & 0.73\end{bmatrix}$
image plane at distance 3 in front of viewpoint

198. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 1) in a 656 x 500 image with the following parameters? l=-4, r=3, b=0, t=3 view type = perspective
camera origin = $\begin{bmatrix}4.0 & 1.0 & 0.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.3 & -0.3 & -0.9\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.85 & -0.51 & -0.17\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.95 & 0.32 & 0.0\end{bmatrix}$
image plane at distance 2 in front of viewpoint

199. Ray R has starting point e=$\begin{bmatrix}-2.74 & -2.42 & 0.66\end{bmatrix}$
and direction d=$\begin{bmatrix}0.22 & 0.44 & 0.87\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}2.0 & -1.0 & 5.0\end{bmatrix}$
$\begin{bmatrix}0.2 & -3.4 & -1.0\end{bmatrix}$
$\begin{bmatrix}2.6 & -0.2 & -3.2\end{bmatrix}$
$\begin{bmatrix}3.8 & 1.4 & 2.6\end{bmatrix}$
$\begin{bmatrix}3.2 & 0.6 & -3.0\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

200. Ray R has starting point e=$\begin{bmatrix}1.95 & -2.09 & 0.27\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.33 & -0.67 & -0.67\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}0.4 & -0.79 & 0.6\end{bmatrix}$
$\begin{bmatrix}1.0 & -4.11 & 2.11\end{bmatrix}$
$\begin{bmatrix}3.41 & -3.51 & -5.73\end{bmatrix}$
$\begin{bmatrix}-0.81 & -0.19 & 3.62\end{bmatrix}$
$\begin{bmatrix}-0.51 & 0.11 & 2.41\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

201. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 2) in a 411 x 434 image with the following parameters? l=-5, r=4, b=-5, t=3 view type = orthographic
camera origin = $\begin{bmatrix}1.0 & 1.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.64 & -0.43 & 0.64\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & 0.71 & -0.71\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.58 & -0.58 & 0.58\end{bmatrix}$

202. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 3) in a 520 x 470 image with the following parameters? l=-4, r=2, b=-3, t=2 view type = perspective
camera origin = $\begin{bmatrix}1.0 & 3.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.87 & -0.22 & -0.44\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.89 & 0.0 & 0.45\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.15 & -0.62 & -0.77\end{bmatrix}$
image plane at distance 1 in front of viewpoint

203. Ray R has starting point e=$\begin{bmatrix}4.7 & 0.9 & -4.27\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.18 & -0.37 & 0.91\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}2.51 & 0.49 & -1.49\end{bmatrix}$
$\begin{bmatrix}2.51 & 0.97 & -2.3\end{bmatrix}$
$\begin{bmatrix}5.27 & -1.3 & -0.35\end{bmatrix}$

$\begin{bmatrix}2.35 & -0.32 & -0.03\end{bmatrix}$
$\begin{bmatrix}-1.22 & 1.78 & -1.16\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

204. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 1) in a 396 x 666 image with the following parameters? l=-5, r=-1, b=-4, t=-2 view type = orthographic camera origin = $\begin{bmatrix}-4.0 & 0.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.8 & 0.6 & 0.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.58 & -0.58 & -0.58\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.22 & 0.44 & 0.87\end{bmatrix}$

205. Ray R has starting point e=$\begin{bmatrix}-17.47 & -1.42 & 2.08\end{bmatrix}$
and direction d=$\begin{bmatrix}0.59 & -0.2 & -0.78\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-6.31 & -1.25 & -1.16\end{bmatrix}$
$\begin{bmatrix}-9.36 & -2.56 & -5.31\end{bmatrix}$
$\begin{bmatrix}-2.38 & -4.53 & -5.75\end{bmatrix}$
$\begin{bmatrix}-1.94 & -4.75 & -5.96\end{bmatrix}$
$\begin{bmatrix}-5.0 & -4.09 & -6.18\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

206. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 2) in a 343 x 678 image with the following parameters? l=-1, r=1, b=-4, t=-1 view type = perspective camera origin = $\begin{bmatrix}2.0 & 0.0 & 2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.45 & 0.0 & 0.89\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.23 & -0.69 & 0.69\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.33 & 0.67 & 0.67\end{bmatrix}$
image plane at distance 2 in front of viewpoint

207. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 1) in a 416 x 298 image with the following parameters? l=-1, r=0, b=2, t=3 view type = perspective camera origin = $\begin{bmatrix}-5.0 & -2.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.0 & -0.71 & -0.71\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.15 & -0.77 & 0.62\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.6 & 0.8 & 0.0\end{bmatrix}$
image plane at distance 1 in front of viewpoint

208. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 4) in a 736 x 399 image with the following parameters? l=1, r=3, b=2, t=4 view type = orthographic camera origin = $\begin{bmatrix}-4.0 & 1.0 & -5.0\end{bmatrix}$

camera u axis = $\begin{bmatrix} -0.41 & 0.41 & 0.82 \end{bmatrix}$
camera v axis = $\begin{bmatrix} 1.0 & 0.0 & 0.0 \end{bmatrix}$
camera w axis = $\begin{bmatrix} -0.53 & -0.53 & -0.66 \end{bmatrix}$

209. Ray R has starting point e=$\begin{bmatrix} 0.28 & 0.67 & -3.87 \end{bmatrix}$
and direction d=$\begin{bmatrix} -0.0 & 0.83 & 0.55 \end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix} 1.65 & 0.94 & -9.66 \end{bmatrix}$
$\begin{bmatrix} -0.24 & 3.77 & 0.71 \end{bmatrix}$
$\begin{bmatrix} 0.24 & 2.36 & -2.59 \end{bmatrix}$
$\begin{bmatrix} 0.47 & -1.65 & -7.54 \end{bmatrix}$
$\begin{bmatrix} -0.47 & -0.24 & -2.35 \end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

210. Ray R has starting point e=$\begin{bmatrix} 4.48 & -4.41 & 2.91 \end{bmatrix}$
and direction d=$\begin{bmatrix} -0.83 & -0.55 & -0.0 \end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix} -0.51 & -1.08 & 4.95 \end{bmatrix}$
$\begin{bmatrix} 3.38 & -6.11 & 3.49 \end{bmatrix}$
$\begin{bmatrix} -0.68 & -6.11 & 1.86 \end{bmatrix}$
$\begin{bmatrix} 2.08 & -5.78 & 3.16 \end{bmatrix}$
$\begin{bmatrix} -4.73 & -7.73 & -0.73 \end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

211. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 1) in a 397 x 735 image with the following parameters? l=-3, r=-1, b=-4, t=-1 view type = perspective
camera origin = $\begin{bmatrix} -3.0 & -1.0 & 0.0 \end{bmatrix}$
camera u axis = $\begin{bmatrix} 0.47 & -0.62 & 0.62 \end{bmatrix}$
camera v axis = $\begin{bmatrix} 0.0 & 0.0 & -1.0 \end{bmatrix}$
camera w axis = $\begin{bmatrix} 0.33 & -0.67 & -0.67 \end{bmatrix}$
image plane at distance 1 in front of viewpoint

212. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 2) in a 660 x 486 image with the following parameters? l=-5, r=4, b=-2, t=3 view type = perspective
camera origin = $\begin{bmatrix} 0.0 & 0.0 & 4.0 \end{bmatrix}$
camera u axis = $\begin{bmatrix} 0.49 & -0.81 & -0.32 \end{bmatrix}$
camera v axis = $\begin{bmatrix} 0.0 & 0.6 & 0.8 \end{bmatrix}$
camera w axis = $\begin{bmatrix} -1.0 & 0.0 & 0.0 \end{bmatrix}$
image plane at distance 4 in front of viewpoint

213. Ray R has starting point e=$\begin{bmatrix}-5.23 & -1.58 & 1.14\end{bmatrix}$
and direction d=$\begin{bmatrix}0.69 & -0.69 & -0.23\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-2.27 & -5.8 & 2.0\end{bmatrix}$
$\begin{bmatrix}-1.2 & -7.41 & 4.41\end{bmatrix}$
$\begin{bmatrix}-1.47 & -2.33 & 1.47\end{bmatrix}$
$\begin{bmatrix}-0.13 & -3.13 & 3.87\end{bmatrix}$
$\begin{bmatrix}-2.27 & 0.61 & -1.21\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

214. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 4) in a 578 x 334 image with the following parameters? l=-1, r=2, b=-1, t=1 view type = orthographic
camera origin = $\begin{bmatrix}4.0 & -3.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.67 & 0.33 & 0.67\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.71 & 0.0 & 0.71\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.8 & 0.27 & -0.53\end{bmatrix}$

215. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 1) in a 284 x 728 image with the following parameters? l=-1, r=2, b=2, t=3 view type = perspective
camera origin = $\begin{bmatrix}4.0 & 1.0 & 2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.22 & -0.44 & -0.87\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.75 & 0.3 & -0.6\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.56 & 0.74 & 0.37\end{bmatrix}$
image plane at distance 1 in front of viewpoint

216. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 4) in a 692 x 347 image with the following parameters? l=-2, r=-1, b=2, t=4 view type = orthographic
camera origin = $\begin{bmatrix}0.0 & 0.0 & 2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-1.0 & 0.0 & 0.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & 0.45 & 0.89\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.39 & -0.65 & -0.65\end{bmatrix}$

217. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 2) in a 611 x 599 image with the following parameters? l=-5, r=-1, b=2, t=3 view type = orthographic
camera origin = $\begin{bmatrix}0.0 & -5.0 & -5.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.91 & 0.18 & -0.37\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.41 & 0.41 & 0.82\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.0 & -0.32 & 0.95\end{bmatrix}$

218. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 2) in a 606 x 335 image with the following parameters? l=-1, r=3, b=-2, t=3 view type = perspective
camera origin = $\begin{bmatrix}-5.0 & -4.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.44 & -0.22 & -0.87\end{bmatrix}$

camera v axis = $\begin{bmatrix}-0.32 & -0.81 & -0.49\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.95 & 0.0 & 0.32\end{bmatrix}$
image plane at distance 1 in front of viewpoint

219. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 2) in a 315 x 355 image with the following parameters? l=-4, r=-3, b=2, t=3 view type = perspective
camera origin = $\begin{bmatrix}-3.0 & 1.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.41 & -0.82 & 0.41\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.33 & 0.67 & 0.67\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.64 & 0.64 & -0.43\end{bmatrix}$
image plane at distance 3 in front of viewpoint

220. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 4) in a 498 x 314 image with the following parameters? l=1, r=4, b=-4, t=-3 view type = perspective
camera origin = $\begin{bmatrix}-1.0 & 4.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.69 & -0.51 & -0.51\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.33 & -0.67 & -0.67\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.41 & -0.41 & 0.82\end{bmatrix}$
image plane at distance 4 in front of viewpoint

221. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 3) in a 659 x 696 image with the following parameters? l=-4, r=1, b=-4, t=2 view type = perspective
camera origin = $\begin{bmatrix}-5.0 & 2.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.7 & -0.7 & 0.14\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & 0.71 & 0.71\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.7 & 0.7 & 0.17\end{bmatrix}$
image plane at distance 4 in front of viewpoint

222. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 0) in a 560 x 377 image with the following parameters? l=-2, r=3, b=-4, t=3 view type = orthographic
camera origin = $\begin{bmatrix}-1.0 & -4.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.33 & -0.67 & 0.67\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & 0.51 & -0.86\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.77 & -0.15 & -0.62\end{bmatrix}$

223. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 2) in a 319 x 485 image with the following parameters? l=1, r=3, b=-3, t=-2 view type = orthographic
camera origin = $\begin{bmatrix}4.0 & -2.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.67 & -0.67 & -0.33\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.59 & 0.2 & 0.78\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.41 & 0.82 & -0.41\end{bmatrix}$

224. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 3) in a 430 x 391 image with the following parameters? l=-4, r=0, b=-3, t=-1 view type = orthographic
camera origin = $\begin{bmatrix}0.0 & -2.0 & 4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.94 & -0.24 & -0.24\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.7 & -0.17 & -0.7\end{bmatrix}$

camera w axis = $\begin{bmatrix}-0.8 & -0.27 & -0.53\end{bmatrix}$

225. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 0) in a 492 x 707 image with the following parameters? l=1, r=2, b=-2, t=2 view type = perspective
camera origin = $\begin{bmatrix}1.0 & 4.0 & 0.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.22 & -0.87 & 0.44\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.87 & -0.35 & 0.35\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.59 & -0.78 & -0.2\end{bmatrix}$
image plane at distance 0 in front of viewpoint

226. Ray R has starting point e=$\begin{bmatrix}-3.52 & 1.03 & 2.32\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.83 & -0.0 & -0.55\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-6.33 & 2.33 & 4.0\end{bmatrix}$
$\begin{bmatrix}-2.0 & -1.0 & 2.0\end{bmatrix}$
$\begin{bmatrix}-7.0 & 4.33 & 1.33\end{bmatrix}$
$\begin{bmatrix}-3.33 & -0.67 & 4.0\end{bmatrix}$
$\begin{bmatrix}-7.0 & 3.67 & 2.67\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

227. Ray R has starting point e=$\begin{bmatrix}-7.77 & -3.93 & -2.97\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.37 & -0.18 & 0.91\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-2.3 & 2.02 & -3.64\end{bmatrix}$
$\begin{bmatrix}-4.09 & -1.55 & 0.39\end{bmatrix}$
$\begin{bmatrix}-0.21 & -3.49 & -3.49\end{bmatrix}$
$\begin{bmatrix}-0.81 & -5.28 & -1.85\end{bmatrix}$
$\begin{bmatrix}-4.39 & -0.81 & 0.39\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

228. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 2) in a 729 x 451 image with the following parameters? l=-5, r=2, b=-3, t=4 view type = orthographic
camera origin = $\begin{bmatrix}3.0 & -1.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.33 & 0.67 & -0.67\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.87 & -0.44 & -0.22\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.58 & -0.58 & -0.58\end{bmatrix}$

229. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 3) in a 694 x 673 image with the following parameters? l=-4, r=3, b=-5, t=-3 view type = orthographic
camera origin = $\begin{bmatrix}2.0 & 4.0 & 1.0\end{bmatrix}$

camera u axis = $\begin{bmatrix}0.97 & -0.24 & 0.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.23 & 0.69 & -0.69\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.41 & 0.41 & -0.82\end{bmatrix}$

230. Ray R has starting point e=$\begin{bmatrix}-3.22 & -8.81 & -1.5\end{bmatrix}$
and direction d=$\begin{bmatrix}0.66 & 0.53 & 0.53\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-2.13 & -8.49 & -0.04\end{bmatrix}$
$\begin{bmatrix}-2.13 & -8.49 & -0.04\end{bmatrix}$
$\begin{bmatrix}-1.69 & -7.4 & -0.47\end{bmatrix}$
$\begin{bmatrix}-3.44 & -5.65 & -1.78\end{bmatrix}$
$\begin{bmatrix}-4.31 & -3.91 & -2.87\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

231. Ray R has starting point e=$\begin{bmatrix}-3.18 & 0.35 & -0.8\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.37 & 0.56 & 0.74\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-3.36 & 0.51 & -0.8\end{bmatrix}$
$\begin{bmatrix}-0.59 & 1.15 & 2.4\end{bmatrix}$
$\begin{bmatrix}-2.72 & 5.84 & -7.84\end{bmatrix}$
$\begin{bmatrix}-4.0 & 2.85 & -5.28\end{bmatrix}$
$\begin{bmatrix}-0.59 & 1.15 & 2.4\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

232. Ray R has starting point e=$\begin{bmatrix}-8.18 & -2.14 & -0.52\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.0 & 0.2 & 0.98\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-1.0 & -3.0 & 3.0\end{bmatrix}$
$\begin{bmatrix}-1.0 & -2.0 & 0.0\end{bmatrix}$
$\begin{bmatrix}-1.0 & -5.0 & 0.0\end{bmatrix}$
$\begin{bmatrix}-1.0 & -3.0 & 7.0\end{bmatrix}$
$\begin{bmatrix}-1.0 & -1.0 & 3.0\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

233. Ray R has starting point e=$\begin{bmatrix}-1.81 & -4.27 & -5.73\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.57 & 0.42 & 0.71\end{bmatrix}$

. Polygon P has vertices $\begin{bmatrix}-5.43 & -5.92 & -7.11\end{bmatrix}$
$\begin{bmatrix}-0.89 & -1.38 & -2.57\end{bmatrix}$
$\begin{bmatrix}-2.35 & -3.32 & -3.7\end{bmatrix}$
$\begin{bmatrix}-3.0 & -3.0 & -5.0\end{bmatrix}$
$\begin{bmatrix}-4.14 & 0.24 & -9.06\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

234. Ray R has starting point e=$\begin{bmatrix}-12.43 & 1.47 & 1.87\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.51 & 0.51 & -0.69\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-3.21 & 5.24 & 3.89\end{bmatrix}$
$\begin{bmatrix}-3.21 & 1.66 & 3.89\end{bmatrix}$
$\begin{bmatrix}-3.21 & 3.45 & 3.89\end{bmatrix}$
$\begin{bmatrix}-1.42 & -3.71 & 4.79\end{bmatrix}$
$\begin{bmatrix}-6.79 & 2.55 & 2.11\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

235. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 1) in a 742 x 703 image with the following parameters? l=-2, r=0, b=-1, t=4 view type = perspective
camera origin = $\begin{bmatrix}4.0 & -2.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.58 & -0.58 & -0.58\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.46 & -0.76 & 0.46\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.64 & -0.64 & -0.43\end{bmatrix}$
image plane at distance 4 in front of viewpoint

236. Ray R has starting point e=$\begin{bmatrix}-8.54 & -3.78 & 3.68\end{bmatrix}$
and direction d=$\begin{bmatrix}0.71 & -0.42 & -0.57\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}5.89 & -6.35 & -6.55\end{bmatrix}$
$\begin{bmatrix}-4.76 & -3.31 & 2.07\end{bmatrix}$
$\begin{bmatrix}4.37 & -3.31 & -0.97\end{bmatrix}$
$\begin{bmatrix}-0.7 & -4.32 & -0.97\end{bmatrix}$
$\begin{bmatrix}-2.9 & -4.15 & 0.04\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

237. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 0) in a 356

x 700 image with the following parameters? l=-4, r=-1, b=1, t=2 view type = perspective
camera origin = $\begin{bmatrix}0.0 & -5.0 & -5.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.49 & -0.81 & 0.32\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & 0.6 & -0.8\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.41 & 0.82 & 0.41\end{bmatrix}$
image plane at distance 3 in front of viewpoint

238. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 2) in a 442 x 660 image with the following parameters? l=-3, r=1, b=-1, t=2 view type = orthographic
camera origin = $\begin{bmatrix}2.0 & -5.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.69 & 0.69 & 0.23\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.44 & -0.87 & 0.22\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.71 & 0.0 & -0.71\end{bmatrix}$

239. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 4) in a 349 x 515 image with the following parameters? l=-3, r=-2, b=1, t=4 view type = perspective
camera origin = $\begin{bmatrix}0.0 & 2.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.67 & -0.33 & -0.67\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.58 & -0.58 & -0.58\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.46 & 0.46 & -0.76\end{bmatrix}$
image plane at distance 2 in front of viewpoint

240. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 3) in a 274 x 553 image with the following parameters? l=-5, r=-2, b=-4, t=1 view type = orthographic
camera origin = $\begin{bmatrix}-1.0 & -2.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.71 & -0.71 & 0.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & -0.71 & 0.71\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.77 & -0.62 & 0.15\end{bmatrix}$

241. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 3) in a 652 x 424 image with the following parameters? l=-1, r=2, b=-4, t=0 view type = perspective
camera origin = $\begin{bmatrix}1.0 & 3.0 & 4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.0 & 0.2 & -0.98\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.71 & 0.71 & 0.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.43 & 0.64 & -0.64\end{bmatrix}$
image plane at distance 2 in front of viewpoint

242. Ray R has starting point e=$\begin{bmatrix}1.17 & -2.88 & -1.4\end{bmatrix}$
and direction d=$\begin{bmatrix}0.41 & 0.82 & 0.41\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}0.02 & 2.71 & -1.2\end{bmatrix}$
$\begin{bmatrix}1.98 & -2.39 & -0.8\end{bmatrix}$
$\begin{bmatrix}1.0 & -3.37 & -1.0\end{bmatrix}$
$\begin{bmatrix}-0.96 & -4.94 & -1.39\end{bmatrix}$
$\begin{bmatrix}1.98 & 1.14 & -0.8\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?

e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

243. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 0) in a 695 x 633 image with the following parameters? l=-4, r=-1, b=-1, t=3 view type = perspective
camera origin = $\begin{bmatrix}0.0 & -5.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.51 & -0.69 & -0.51\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.58 & -0.58 & -0.58\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.91 & -0.18 & -0.37\end{bmatrix}$
image plane at distance 1 in front of viewpoint

244. Ray R has starting point e=$\begin{bmatrix}0.51 & 1.01 & -0.43\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.41 & -0.82 & 0.41\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-1.21 & 0.3 & 0.11\end{bmatrix}$
$\begin{bmatrix}-0.3 & 0.6 & 0.11\end{bmatrix}$
$\begin{bmatrix}1.51 & 0.9 & -0.79\end{bmatrix}$
$\begin{bmatrix}-1.81 & 0.6 & 1.62\end{bmatrix}$
$\begin{bmatrix}1.21 & 1.51 & 1.32\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

245. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 4) in a 312 x 298 image with the following parameters? l=1, r=2, b=-2, t=4 view type = perspective
camera origin = $\begin{bmatrix}-3.0 & -4.0 & 4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.64 & 0.43 & -0.64\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.53 & 0.8 & -0.27\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.49 & 0.73 & 0.49\end{bmatrix}$
image plane at distance 1 in front of viewpoint

246. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 1) in a 457 x 458 image with the following parameters? l=0, r=1, b=-2, t=-1 view type = orthographic
camera origin = $\begin{bmatrix}0.0 & -1.0 & 4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.85 & 0.17 & 0.51\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.67 & 0.33 & -0.67\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.78 & 0.62 & 0.0\end{bmatrix}$

247. Ray R has starting point e=$\begin{bmatrix}1.27 & 1.99 & 1.33\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.0 & 0.71 & 0.71\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}2.43 & 3.98 & 2.6\end{bmatrix}$
$\begin{bmatrix}-2.79 & -2.58 & -3.37\end{bmatrix}$
$\begin{bmatrix}-5.47 & 0.11 & 8.71\end{bmatrix}$
$\begin{bmatrix}2.13 & 3.09 & 0.96\end{bmatrix}$
$\begin{bmatrix}-2.19 & -0.79 & -0.09\end{bmatrix}$
.
b) What is the normal to P?

c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

248. Ray R has starting point e=$\begin{bmatrix}-3.65 & -5.14 & -3.16\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.24 & 0.24 & -0.94\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-1.54 & -1.88 & -5.53\end{bmatrix}$
$\begin{bmatrix}-7.64 & -5.99 & -7.12\end{bmatrix}$
$\begin{bmatrix}-4.59 & -6.91 & -3.94\end{bmatrix}$
$\begin{bmatrix}-1.54 & -6.52 & -1.82\end{bmatrix}$
$\begin{bmatrix}-4.06 & -3.07 & -6.59\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

249. Ray R has starting point e=$\begin{bmatrix}0.56 & -5.51 & 5.57\end{bmatrix}$ and direction d=$\begin{bmatrix}1.0 & -0.0 & -0.0\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}1.76 & -6.18 & 8.48\end{bmatrix}$
$\begin{bmatrix}-1.77 & -4.53 & -1.66\end{bmatrix}$
$\begin{bmatrix}4.36 & -4.29 & 3.53\end{bmatrix}$
$\begin{bmatrix}6.48 & -4.29 & 5.65\end{bmatrix}$
$\begin{bmatrix}-0.12 & -5.47 & 3.76\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

250. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 0) in a 627 x 708 image with the following parameters? l=-5, r=4, b=-1, t=1 view type = perspective
camera origin = $\begin{bmatrix}-4.0 & 1.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.6 & 0.3 & -0.75\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & 0.71 & -0.71\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.56 & 0.37 & 0.74\end{bmatrix}$
image plane at distance 1 in front of viewpoint

251. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 0) in a 650 x 660 image with the following parameters? l=-4, r=3, b=2, t=3 view type = orthographic
camera origin = $\begin{bmatrix}0.0 & -5.0 & 0.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.95 & 0.0 & 0.32\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.83 & 0.0 & -0.55\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.98 & 0.2 & 0.0\end{bmatrix}$

252. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 4) in a 484 x 361 image with the following parameters? l=0, r=3, b=-2, t=0 view type = orthographic camera origin = $\begin{bmatrix}-1.0 & 2.0 & 2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.0 & 0.6 & -0.8\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.33 & -0.67 & -0.67\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.0 & 1.0 & 0.0\end{bmatrix}$

253. Ray R has starting point e=$\begin{bmatrix}-6.05 & -0.93 & -0.92\end{bmatrix}$ and direction d=$\begin{bmatrix}0.23 & 0.69 & 0.69\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}3.74 & -3.71 & 5.46\end{bmatrix}$
$\begin{bmatrix}5.97 & -2.6 & 2.49\end{bmatrix}$
$\begin{bmatrix}0.03 & 2.04 & 0.26\end{bmatrix}$
$\begin{bmatrix}8.2 & -0.93 & -1.23\end{bmatrix}$
$\begin{bmatrix}1.7 & -0.19 & 2.11\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

254. Ray R has starting point e=$\begin{bmatrix}-6.99 & 0.59 & 0.58\end{bmatrix}$ and direction d=$\begin{bmatrix}0.87 & 0.35 & 0.35\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-1.0 & 1.33 & 4.67\end{bmatrix}$
$\begin{bmatrix}0.33 & 4.33 & 8.0\end{bmatrix}$
$\begin{bmatrix}-2.33 & 0.0 & 4.67\end{bmatrix}$
$\begin{bmatrix}-3.33 & -0.33 & 6.0\end{bmatrix}$
$\begin{bmatrix}-2.0 & 0.0 & 4.0\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

255. Ray R has starting point e=$\begin{bmatrix}-3.38 & 2.25 & 1.51\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.37 & -0.74 & 0.56\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-6.62 & 1.01 & 5.78\end{bmatrix}$
$\begin{bmatrix}-5.85 & 1.47 & 4.7\end{bmatrix}$
$\begin{bmatrix}-1.69 & 1.62 & -0.55\end{bmatrix}$
$\begin{bmatrix}-4.93 & -1.93 & 4.39\end{bmatrix}$
$\begin{bmatrix}-2.3 & -2.08 & 1.15\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

256. Ray R has starting point e=$\begin{bmatrix}-6.14 & 1.74 & -0.66\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.27 & -0.8 & 0.53\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-5.0 & -1.67 & 3.33\end{bmatrix}$
$\begin{bmatrix}-4.0 & 3.67 & 1.67\end{bmatrix}$
$\begin{bmatrix}-4.33 & -0.33 & 3.33\end{bmatrix}$
$\begin{bmatrix}-3.67 & 5.0 & 1.33\end{bmatrix}$
$\begin{bmatrix}-0.67 & 0.33 & 6.67\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

257. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 2) in a 379 x 314 image with the following parameters? l=-3, r=2, b=2, t=4 view type = orthographic
camera origin = $\begin{bmatrix}2.0 & -1.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.59 & 0.78 & 0.2\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.32 & 0.0 & 0.95\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.53 & -0.27 & -0.8\end{bmatrix}$

258. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 1) in a 475 x 301 image with the following parameters? l=-3, r=4, b=-4, t=-3 view type = perspective
camera origin = $\begin{bmatrix}-5.0 & 3.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.76 & -0.46 & 0.46\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.44 & 0.22 & 0.87\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.53 & -0.27 & 0.8\end{bmatrix}$
image plane at distance 2 in front of viewpoint

259. Ray R has starting point e=$\begin{bmatrix}1.37 & 2.26 & -4.19\end{bmatrix}$
and direction d=$\begin{bmatrix}0.71 & -0.57 & 0.42\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-2.11 & 0.91 & -5.45\end{bmatrix}$
$\begin{bmatrix}9.37 & 5.39 & -5.3\end{bmatrix}$
$\begin{bmatrix}3.7 & 1.21 & -2.91\end{bmatrix}$
$\begin{bmatrix}3.7 & 4.19 & -6.64\end{bmatrix}$
$\begin{bmatrix}4.45 & 3.89 & -5.89\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

260. Ray R has starting point e=$\begin{bmatrix}-11.52 & -0.19 & -0.83\end{bmatrix}$
and direction d=$\begin{bmatrix}0.27 & 0.53 & 0.8\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-6.93 & 5.55 & -3.23\end{bmatrix}$
$\begin{bmatrix}-6.47 & -6.33 & -5.24\end{bmatrix}$
$\begin{bmatrix}-7.7 & 5.55 & -3.85\end{bmatrix}$

$\begin{bmatrix}-3.23 & 1.54 & -1.07\end{bmatrix}$
$\begin{bmatrix}-7.39 & 1.23 & -4.47\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

261. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 0) in a 548 x 670 image with the following parameters? l=-5, r=3, b=-1, t=1 view type = perspective camera origin = $\begin{bmatrix}-2.0 & 4.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.69 & 0.51 & 0.51\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.94 & -0.24 & -0.24\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.0 & -0.89 & 0.45\end{bmatrix}$
image plane at distance 3 in front of viewpoint

262. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 0) in a 498 x 639 image with the following parameters? l=-2, r=2, b=0, t=4 view type = orthographic camera origin = $\begin{bmatrix}-2.0 & -1.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.78 & -0.59 & -0.2\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.62 & 0.49 & -0.62\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.86 & -0.51 & 0.0\end{bmatrix}$

263. Ray R has starting point e=$\begin{bmatrix}-1.05 & 2.27 & -1.59\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.0 & -0.71 & -0.71\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}0.8 & -0.47 & -2.06\end{bmatrix}$
$\begin{bmatrix}-0.8 & 6.47 & -7.94\end{bmatrix}$
$\begin{bmatrix}-3.21 & -1.28 & -7.67\end{bmatrix}$
$\begin{bmatrix}-1.34 & 7.54 & -9.28\end{bmatrix}$
$\begin{bmatrix}1.34 & -0.47 & -1.26\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

264. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 1) in a 516 x 701 image with the following parameters? l=0, r=1, b=-5, t=-2 view type = perspective camera origin = $\begin{bmatrix}1.0 & -1.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.58 & -0.58 & -0.58\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.17 & -0.85 & 0.51\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.87 & -0.44 & -0.22\end{bmatrix}$
image plane at distance 1 in front of viewpoint

265. Ray R has starting point e=$\begin{bmatrix}-7.95 & 4.59 & 2.57\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.53 & 0.27 & -0.8\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}2.89 & 3.0 & -2.0\end{bmatrix}$

$\begin{bmatrix}-4.71 & 1.21 & -5.58\end{bmatrix}$
$\begin{bmatrix}3.34 & 3.0 & -2.0\end{bmatrix}$
$\begin{bmatrix}3.34 & 5.24 & 2.47\end{bmatrix}$
$\begin{bmatrix}1.55 & 5.24 & 2.47\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

266. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 4) in a 283 x 671 image with the following parameters? l=-3, r=1, b=-1, t=4 view type = perspective camera origin = $\begin{bmatrix}4.0 & 2.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}1.0 & 0.0 & 0.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.45 & 0.89 & 0.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.51 & -0.51 & 0.69\end{bmatrix}$
image plane at distance 3 in front of viewpoint

267. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 3) in a 724 x 731 image with the following parameters? l=-5, r=-4, b=-4, t=-3 view type = perspective camera origin = $\begin{bmatrix}-3.0 & -5.0 & -5.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.7 & 0.7 & -0.17\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.83 & 0.55 & 0.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.0 & -1.0 & 0.0\end{bmatrix}$
image plane at distance 2 in front of viewpoint

268. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 3) in a 375 x 263 image with the following parameters? l=0, r=2, b=-2, t=1 view type = perspective camera origin = $\begin{bmatrix}-4.0 & 0.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.42 & -0.71 & 0.57\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & 0.83 & 0.55\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.14 & -0.7 & -0.7\end{bmatrix}$
image plane at distance 1 in front of viewpoint

269. Ray R has starting point e=$\begin{bmatrix}-6.89 & 0.45 & 0.58\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.7 & -0.7 & 0.17\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-4.07 & -4.67 & 5.6\end{bmatrix}$
$\begin{bmatrix}-1.13 & 2.28 & 1.33\end{bmatrix}$
$\begin{bmatrix}-6.47 & 0.14 & 5.6\end{bmatrix}$
$\begin{bmatrix}-6.21 & -6.81 & 7.74\end{bmatrix}$
$\begin{bmatrix}1.54 & -3.87 & 1.59\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

270. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 1) in a 406 x 577 image with the following parameters? l=0, r=2, b=2, t=3 view type = orthographic camera origin = $\begin{bmatrix}-3.0 & 4.0 & 2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.69 & -0.69 & -0.23\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.6 & -0.75 & -0.3\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.58 & 0.58 & 0.58\end{bmatrix}$

271. Ray R has starting point e=$\begin{bmatrix}-16.43 & 3.24 & -2.41\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.0 & -0.51 & 0.86\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-6.15 & 4.15 & 2.0\end{bmatrix}$
$\begin{bmatrix}-6.15 & 1.85 & -0.31\end{bmatrix}$
$\begin{bmatrix}-7.89 & 2.42 & -1.46\end{bmatrix}$
$\begin{bmatrix}-6.15 & 0.69 & -1.46\end{bmatrix}$
$\begin{bmatrix}-3.27 & -0.46 & 0.27\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

272. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 0) in a 439 x 477 image with the following parameters? l=-3, r=-1, b=0, t=1 view type = orthographic camera origin = $\begin{bmatrix}-1.0 & 0.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.67 & 0.67 & 0.33\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.23 & -0.69 & -0.69\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.97 & 0.0 & 0.24\end{bmatrix}$

273. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 0) in a 734 x 687 image with the following parameters? l=-3, r=-2, b=-5, t=2 view type = perspective camera origin = $\begin{bmatrix}-3.0 & -1.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.3 & 0.3 & 0.9\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.8 & -0.53 & 0.27\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.18 & -0.91 & 0.37\end{bmatrix}$
image plane at distance 4 in front of viewpoint

274. Ray R has starting point e=$\begin{bmatrix}1.87 & -3.75 & -3.09\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.62 & 0.78 & -0.0\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}0.8 & -0.41 & -3.02\end{bmatrix}$
$\begin{bmatrix}1.2 & -4.33 & -4.98\end{bmatrix}$
$\begin{bmatrix}0.22 & 0.57 & -0.08\end{bmatrix}$
$\begin{bmatrix}0.22 & -3.94 & -0.08\end{bmatrix}$
$\begin{bmatrix}1.78 & -1.98 & -7.92\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?

e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

275. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 2) in a 663 x 577 image with the following parameters? l=2, r=3, b=0, t=4 view type = perspective
camera origin = $\begin{bmatrix}-4.0 & -1.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.51 & 0.51 & -0.69\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.83 & 0.0 & -0.55\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.87 & -0.22 & 0.44\end{bmatrix}$
image plane at distance 2 in front of viewpoint

276. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 3) in a 629 x 614 image with the following parameters? l=-5, r=-1, b=1, t=3 view type = orthographic
camera origin = $\begin{bmatrix}0.0 & 2.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.24 & -0.24 & 0.94\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.15 & 0.62 & -0.77\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.53 & 0.27 & -0.8\end{bmatrix}$

277. Ray R has starting point e=$\begin{bmatrix}7.13 & 4.12 & 8.01\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.71 & -0.0 & -0.71\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}4.24 & 4.89 & 4.45\end{bmatrix}$
$\begin{bmatrix}-1.58 & 0.42 & 2.21\end{bmatrix}$
$\begin{bmatrix}-2.02 & 0.42 & 2.21\end{bmatrix}$
$\begin{bmatrix}5.13 & 2.21 & 3.11\end{bmatrix}$
$\begin{bmatrix}6.02 & 3.11 & 3.55\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

278. Ray R has starting point e=$\begin{bmatrix}-8.23 & -1.97 & 0.33\end{bmatrix}$
and direction d=$\begin{bmatrix}0.76 & 0.46 & 0.46\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-1.38 & 0.31 & -0.85\end{bmatrix}$
$\begin{bmatrix}2.52 & -4.51 & -6.36\end{bmatrix}$
$\begin{bmatrix}3.44 & 2.38 & -4.98\end{bmatrix}$
$\begin{bmatrix}1.61 & 3.75 & -2.69\end{bmatrix}$
$\begin{bmatrix}2.29 & -1.75 & -5.21\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

279. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 2) in a 495 x 468 image with the following parameters? l=-1, r=0, b=0, t=4 view type = orthographic
camera origin = $\begin{bmatrix}1.0 & 1.0 & 2.0\end{bmatrix}$

camera u axis = $\begin{bmatrix} 0.0 & -0.6 & -0.8 \end{bmatrix}$
camera v axis = $\begin{bmatrix} -0.62 & 0.47 & -0.62 \end{bmatrix}$
camera w axis = $\begin{bmatrix} 0.32 & 0.49 & -0.81 \end{bmatrix}$

280. Ray R has starting point e=$\begin{bmatrix} -14.57 & -1.12 & -0.93 \end{bmatrix}$
and direction d=$\begin{bmatrix} 0.71 & -0.42 & 0.57 \end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix} -3.88 & -2.11 & -0.34 \end{bmatrix}$
$\begin{bmatrix} -4.71 & 1.22 & -5.33 \end{bmatrix}$
$\begin{bmatrix} -4.71 & -1.55 & -1.17 \end{bmatrix}$
$\begin{bmatrix} 0.0 & -3.77 & 2.16 \end{bmatrix}$
$\begin{bmatrix} -4.16 & 0.66 & -4.5 \end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

281. Ray R has starting point e=$\begin{bmatrix} -16.61 & -4.74 & -2.69 \end{bmatrix}$
and direction d=$\begin{bmatrix} 0.47 & 0.62 & 0.62 \end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix} -1.73 & -4.74 & -2.41 \end{bmatrix}$
$\begin{bmatrix} 3.08 & -5.54 & -1.34 \end{bmatrix}$
$\begin{bmatrix} -7.35 & -3.94 & -3.74 \end{bmatrix}$
$\begin{bmatrix} 1.74 & -2.87 & 0.0 \end{bmatrix}$
$\begin{bmatrix} -1.73 & 1.67 & 1.87 \end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

282. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 4) in a 726 x 725 image with the following parameters? l=-3, r=2, b=-4, t=1 view type = orthographic
camera origin = $\begin{bmatrix} -5.0 & 3.0 & -5.0 \end{bmatrix}$
camera u axis = $\begin{bmatrix} 0.47 & 0.62 & 0.62 \end{bmatrix}$
camera v axis = $\begin{bmatrix} -0.67 & -0.33 & 0.67 \end{bmatrix}$
camera w axis = $\begin{bmatrix} -0.71 & 0.57 & -0.42 \end{bmatrix}$

283. Ray R has starting point e=$\begin{bmatrix} 0.36 & 1.02 & 1.0 \end{bmatrix}$
and direction d=$\begin{bmatrix} -0.94 & -0.24 & -0.24 \end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix} -3.67 & 0.67 & -1.67 \end{bmatrix}$
$\begin{bmatrix} -6.67 & -2.0 & -2.33 \end{bmatrix}$
$\begin{bmatrix} -3.0 & 0.0 & 1.0 \end{bmatrix}$
$\begin{bmatrix} -1.67 & 5.0 & -6.33 \end{bmatrix}$
$\begin{bmatrix} 0.67 & 4.0 & 0.33 \end{bmatrix}$
.

b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

284. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 1) in a 458 x 365 image with the following parameters? l=-2, r=1, b=2, t=4 view type = perspective camera origin = $\begin{bmatrix}-4.0 & 4.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.8 & 0.27 & 0.53\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.37 & -0.74 & -0.56\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.91 & -0.18 & 0.37\end{bmatrix}$
image plane at distance 1 in front of viewpoint

285. Ray R has starting point e=$\begin{bmatrix}-9.16 & 4.84 & 1.69\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.41 & -0.82 & -0.41\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-1.59 & 1.13 & -3.2\end{bmatrix}$
$\begin{bmatrix}-1.86 & 2.2 & -5.87\end{bmatrix}$
$\begin{bmatrix}-2.93 & 1.4 & -1.33\end{bmatrix}$
$\begin{bmatrix}-6.67 & 4.34 & -2.66\end{bmatrix}$
$\begin{bmatrix}-2.66 & 2.2 & -4.27\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

286. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 3) in a 302 x 675 image with the following parameters? l=-2, r=-1, b=-5, t=3 view type = orthographic camera origin = $\begin{bmatrix}-3.0 & 1.0 & 0.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.0 & -0.89 & 0.45\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.7 & 0.14 & -0.7\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.59 & 0.78 & 0.2\end{bmatrix}$

287. Ray R has starting point e=$\begin{bmatrix}-8.55 & -4.2 & 1.32\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.67 & -0.67 & -0.33\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}0.54 & -7.54 & -4.24\end{bmatrix}$
$\begin{bmatrix}-4.41 & -2.59 & 0.71\end{bmatrix}$
$\begin{bmatrix}-3.71 & -3.29 & 5.66\end{bmatrix}$
$\begin{bmatrix}-5.83 & -1.17 & -2.12\end{bmatrix}$
$\begin{bmatrix}-3.71 & -3.29 & 2.12\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

288. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 3) in a 357 x 724 image with the following parameters? l=2, r=4, b=-4, t=1 view type = orthographic camera origin = $\begin{bmatrix}2.0 & -4.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.51 & -0.69 & -0.51\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.81 & -0.49 & -0.32\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.67 & -0.33 & 0.67\end{bmatrix}$

289. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 0) in a 479 x 591 image with the following parameters? l=-4, r=0, b=-5, t=-4 view type = perspective camera origin = $\begin{bmatrix}-4.0 & 0.0 & 0.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.0 & 0.45 & -0.89\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.27 & 0.8 & 0.53\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.58 & 0.58 & 0.58\end{bmatrix}$
image plane at distance 4 in front of viewpoint

290. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 0) in a 668 x 339 image with the following parameters? l=1, r=4, b=0, t=4 view type = orthographic camera origin = $\begin{bmatrix}1.0 & 2.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.0 & 0.71 & 0.71\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.69 & -0.51 & -0.51\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.83 & 0.0 & -0.55\end{bmatrix}$

291. Ray R has starting point e=$\begin{bmatrix}2.61 & -4.29 & 3.71\end{bmatrix}$
and direction d=$\begin{bmatrix}0.73 & 0.49 & 0.49\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}3.54 & -8.54 & -0.54\end{bmatrix}$
$\begin{bmatrix}2.12 & -5.71 & 2.29\end{bmatrix}$
$\begin{bmatrix}3.54 & -2.17 & 5.83\end{bmatrix}$
$\begin{bmatrix}4.95 & -2.88 & 5.12\end{bmatrix}$
$\begin{bmatrix}0.71 & -2.88 & 5.12\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

292. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 1) in a 504 x 340 image with the following parameters? l=0, r=2, b=4, t=5 view type = orthographic camera origin = $\begin{bmatrix}-1.0 & -4.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.51 & 0.51 & -0.69\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.37 & -0.56 & -0.74\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.71 & -0.71 & 0.0\end{bmatrix}$

293. Ray R has starting point e=$\begin{bmatrix}-5.77 & -5.79 & 3.54\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.62 & 0.62 & -0.47\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-7.77 & -4.06 & 2.18\end{bmatrix}$
$\begin{bmatrix}-5.18 & -4.29 & 1.47\end{bmatrix}$

$\begin{bmatrix}-8.48 & -3.82 & 2.41\end{bmatrix}$
$\begin{bmatrix}-8.95 & -7.12 & 1.71\end{bmatrix}$
$\begin{bmatrix}-2.11 & -3.11 & 1.0\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

294. Ray R has starting point e=$\begin{bmatrix}-11.4 & -6.04 & -0.24\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.0 & 0.71 & 0.71\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}1.19 & 0.68 & -1.61\end{bmatrix}$
$\begin{bmatrix}-1.79 & -6.17 & -7.88\end{bmatrix}$
$\begin{bmatrix}-0.6 & -2.45 & -3.4\end{bmatrix}$
$\begin{bmatrix}-1.49 & -4.09 & -4.45\end{bmatrix}$
$\begin{bmatrix}2.39 & -0.51 & -6.98\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

295. Ray R has starting point e=$\begin{bmatrix}-2.65 & -6.42 & 1.63\end{bmatrix}$
and direction d=$\begin{bmatrix}0.49 & -0.73 & -0.49\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}1.41 & -1.08 & 0.68\end{bmatrix}$
$\begin{bmatrix}0.81 & -4.7 & -1.13\end{bmatrix}$
$\begin{bmatrix}-1.6 & -7.41 & 3.4\end{bmatrix}$
$\begin{bmatrix}-0.7 & -5.0 & 3.1\end{bmatrix}$
$\begin{bmatrix}0.21 & -3.19 & 2.19\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

296. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 2) in a 633 x 334 image with the following parameters? l=-3, r=4, b=0, t=3 view type = perspective
camera origin = $\begin{bmatrix}2.0 & 2.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.0 & 0.45 & -0.89\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.3 & -0.9 & -0.3\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.74 & 0.56 & 0.37\end{bmatrix}$
image plane at distance 3 in front of viewpoint

297. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 2) in a 306 x 639 image with the following parameters? l=-2, r=3, b=-1, t=2 view type = orthographic
camera origin = $\begin{bmatrix}-2.0 & -5.0 & -1.0\end{bmatrix}$

camera u axis = $\begin{bmatrix} -0.97 & 0.0 & 0.24 \end{bmatrix}$
camera v axis = $\begin{bmatrix} -0.58 & 0.58 & -0.58 \end{bmatrix}$
camera w axis = $\begin{bmatrix} -0.53 & -0.66 & -0.53 \end{bmatrix}$

298. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 2) in a 671 x 322 image with the following parameters? l=-2, r=-1, b=-5, t=-2 view type = orthographic
camera origin = $\begin{bmatrix} -1.0 & 3.0 & 0.0 \end{bmatrix}$
camera u axis = $\begin{bmatrix} -0.27 & -0.8 & -0.53 \end{bmatrix}$
camera v axis = $\begin{bmatrix} 0.33 & -0.67 & 0.67 \end{bmatrix}$
camera w axis = $\begin{bmatrix} -0.96 & 0.19 & 0.19 \end{bmatrix}$

299. Ray R has starting point e=$\begin{bmatrix} 2.58 & 4.68 & 5.93 \end{bmatrix}$
and direction d=$\begin{bmatrix} -0.71 & -0.0 & -0.71 \end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix} 1.59 & 5.07 & 5.6 \end{bmatrix}$
$\begin{bmatrix} 3.47 & 3.73 & 5.87 \end{bmatrix}$
$\begin{bmatrix} 6.41 & 2.13 & 4.8 \end{bmatrix}$
$\begin{bmatrix} 2.66 & 6.14 & 0.26 \end{bmatrix}$
$\begin{bmatrix} 1.33 & 5.07 & 6.14 \end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

300. Ray R has starting point e=$\begin{bmatrix} -10.07 & -3.22 & 0.09 \end{bmatrix}$
and direction d=$\begin{bmatrix} -0.69 & -0.23 & 0.69 \end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix} -2.0 & -5.11 & -0.11 \end{bmatrix}$
$\begin{bmatrix} -2.6 & -2.7 & 4.11 \end{bmatrix}$
$\begin{bmatrix} -2.0 & -5.71 & -0.71 \end{bmatrix}$
$\begin{bmatrix} -2.6 & -3.3 & 3.51 \end{bmatrix}$
$\begin{bmatrix} -1.1 & -1.19 & 1.1 \end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

301. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 3) in a 315 x 583 image with the following parameters? l=-1, r=1, b=1, t=4 view type = perspective
camera origin = $\begin{bmatrix} -4.0 & 3.0 & -4.0 \end{bmatrix}$
camera u axis = $\begin{bmatrix} 0.62 & 0.47 & 0.62 \end{bmatrix}$
camera v axis = $\begin{bmatrix} -0.37 & -0.56 & 0.74 \end{bmatrix}$
camera w axis = $\begin{bmatrix} -0.96 & -0.19 & -0.19 \end{bmatrix}$
image plane at distance 2 in front of viewpoint

302. Ray R has starting point e=$\begin{bmatrix}-0.52 & 3.94 & 4.27\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.0 & -1.0 & -0.0\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-0.66 & 2.88 & 4.5\end{bmatrix}$
$\begin{bmatrix}-0.66 & -2.39 & 4.5\end{bmatrix}$
$\begin{bmatrix}1.55 & -2.11 & 1.17\end{bmatrix}$
$\begin{bmatrix}2.66 & -3.5 & -0.5\end{bmatrix}$
$\begin{bmatrix}-1.22 & 2.61 & 5.33\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

303. Ray R has starting point e=$\begin{bmatrix}-15.09 & -0.51 & 1.11\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.8 & 0.53 & -0.27\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-2.28 & 1.93 & 2.12\end{bmatrix}$
$\begin{bmatrix}-4.66 & 3.65 & 1.59\end{bmatrix}$
$\begin{bmatrix}-1.62 & -2.05 & -0.53\end{bmatrix}$
$\begin{bmatrix}-7.44 & -0.19 & -3.71\end{bmatrix}$
$\begin{bmatrix}-2.94 & 1.26 & 1.06\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

304. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 3) in a 610 x 372 image with the following parameters? l=-5, r=-1, b=-5, t=-2 view type = perspective
camera origin = $\begin{bmatrix}-4.0 & 0.0 & 2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.66 & 0.53 & -0.53\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.51 & -0.17 & -0.85\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.81 & -0.49 & -0.32\end{bmatrix}$
image plane at distance 0 in front of viewpoint

305. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 4) in a 561 x 433 image with the following parameters? l=-1, r=3, b=-1, t=3 view type = orthographic
camera origin = $\begin{bmatrix}-1.0 & 3.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.91 & 0.37 & 0.18\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.67 & 0.67 & 0.33\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.64 & -0.64 & 0.43\end{bmatrix}$

306. Ray R has starting point e=$\begin{bmatrix}-2.65 & -5.18 & -2.34\end{bmatrix}$
and direction d=$\begin{bmatrix}0.49 & 0.62 & 0.62\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}1.09 & -1.21 & 0.21\end{bmatrix}$
$\begin{bmatrix}-3.09 & -4.7 & -2.57\end{bmatrix}$
$\begin{bmatrix}-0.83 & -3.48 & 1.61\end{bmatrix}$

$\begin{bmatrix}1.96 & -1.91 & 6.48\end{bmatrix}$
$\begin{bmatrix}0.22 & -3.3 & 5.09\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

307. Ray R has starting point e=$\begin{bmatrix}0.35 & 1.55 & -1.58\end{bmatrix}$
and direction d=$\begin{bmatrix}0.94 & -0.24 & -0.24\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}5.55 & 2.32 & -0.54\end{bmatrix}$
$\begin{bmatrix}4.62 & 1.7 & -2.7\end{bmatrix}$
$\begin{bmatrix}0.15 & -3.39 & -4.7\end{bmatrix}$
$\begin{bmatrix}2.31 & -0.61 & -5.01\end{bmatrix}$
$\begin{bmatrix}4.31 & 0.47 & 0.7\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

308. Ray R has starting point e=$\begin{bmatrix}-6.65 & -5.36 & 2.93\end{bmatrix}$
and direction d=$\begin{bmatrix}0.74 & 0.37 & -0.56\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}5.0 & -4.33 & 2.67\end{bmatrix}$
$\begin{bmatrix}4.0 & -1.0 & -2.0\end{bmatrix}$
$\begin{bmatrix}4.33 & -3.33 & 2.0\end{bmatrix}$
$\begin{bmatrix}5.33 & -3.67 & 0.67\end{bmatrix}$
$\begin{bmatrix}6.33 & -5.33 & 2.0\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

309. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 2) in a 345 x 371 image with the following parameters? l=1, r=2, b=-2, t=2 view type = orthographic
camera origin = $\begin{bmatrix}0.0 & -1.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.46 & 0.46 & -0.76\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.3 & -0.75 & -0.6\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.32 & -0.81 & 0.49\end{bmatrix}$

310. Ray R has starting point e=$\begin{bmatrix}-16.71 & 0.04 & 1.83\end{bmatrix}$
and direction d=$\begin{bmatrix}0.98 & -0.0 & -0.2\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}2.34 & -3.03 & 5.03\end{bmatrix}$
$\begin{bmatrix}0.29 & 0.06 & 2.97\end{bmatrix}$

$\begin{bmatrix}1.14 & -0.97 & 3.49\end{bmatrix}$
$\begin{bmatrix}-2.8 & 0.06 & 6.06\end{bmatrix}$
$\begin{bmatrix}4.4 & -3.03 & 2.97\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

311. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 4) in a 598 x 478 image with the following parameters? l=0, r=3, b=-1, t=0 view type = orthographic camera origin = $\begin{bmatrix}3.0 & -4.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.0 & -0.71 & 0.71\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.69 & 0.23 & 0.69\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.51 & -0.69 & -0.51\end{bmatrix}$

312. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 0) in a 568 x 613 image with the following parameters? l=-5, r=-1, b=-4, t=-2 view type = orthographic camera origin = $\begin{bmatrix}-2.0 & -5.0 & 0.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.0 & -0.86 & -0.51\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.71 & -0.57 & 0.42\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.3 & -0.75 & -0.6\end{bmatrix}$

313. Ray R has starting point e=$\begin{bmatrix}-4.46 & -2.18 & -0.62\end{bmatrix}$
and direction d=$\begin{bmatrix}0.22 & 0.87 & 0.44\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-0.6 & 0.8 & 0.8\end{bmatrix}$
$\begin{bmatrix}-0.6 & 0.8 & -4.0\end{bmatrix}$
$\begin{bmatrix}-3.0 & -1.0 & -0.2\end{bmatrix}$
$\begin{bmatrix}0.2 & 1.4 & -1.6\end{bmatrix}$
$\begin{bmatrix}-2.2 & -0.4 & 0.2\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

314. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 3) in a 539 x 681 image with the following parameters? l=-3, r=4, b=-3, t=2 view type = perspective camera origin = $\begin{bmatrix}3.0 & -2.0 & -5.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.58 & -0.58 & -0.58\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.58 & -0.58 & 0.58\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.27 & -0.68 & -0.68\end{bmatrix}$
image plane at distance 1 in front of viewpoint

315. Ray R has starting point e=$\begin{bmatrix}-1.22 & 6.39 & -5.48\end{bmatrix}$
and direction d=$\begin{bmatrix}0.78 & -0.0 & 0.62\end{bmatrix}$

. Polygon P has vertices $\begin{bmatrix}0.0 & 2.37 & -5.63\end{bmatrix}$
$\begin{bmatrix}2.45 & 8.49 & -4.41\end{bmatrix}$
$\begin{bmatrix}-1.22 & 4.82 & -0.73\end{bmatrix}$
$\begin{bmatrix}-2.04 & -1.72 & -5.63\end{bmatrix}$
$\begin{bmatrix}2.86 & 6.45 & -7.27\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

316. Ray R has starting point e=$\begin{bmatrix}-4.44 & 3.81 & 2.78\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.17 & 0.7 & -0.7\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-6.27 & 7.82 & -0.27\end{bmatrix}$
$\begin{bmatrix}-3.3 & 7.39 & -2.39\end{bmatrix}$
$\begin{bmatrix}-3.73 & 0.18 & 2.27\end{bmatrix}$
$\begin{bmatrix}-7.12 & 1.17 & 4.39\end{bmatrix}$
$\begin{bmatrix}-5.71 & 9.66 & -1.83\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

317. Ray R has starting point e=$\begin{bmatrix}-6.62 & -4.07 & -0.18\end{bmatrix}$
and direction d=$\begin{bmatrix}0.75 & 0.6 & 0.3\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}6.9 & -5.9 & 3.0\end{bmatrix}$
$\begin{bmatrix}1.26 & -1.78 & 2.09\end{bmatrix}$
$\begin{bmatrix}9.64 & -6.35 & 4.37\end{bmatrix}$
$\begin{bmatrix}6.9 & -0.56 & 6.2\end{bmatrix}$
$\begin{bmatrix}4.3 & -7.12 & 0.71\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

318. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 1) in a 562 x 521 image with the following parameters? l=-2, r=0, b=2, t=4 view type = orthographic
camera origin = $\begin{bmatrix}-2.0 & 2.0 & 2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.75 & -0.6 & -0.3\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.45 & 0.0 & -0.89\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.78 & -0.59 & 0.2\end{bmatrix}$

319. Ray R has starting point e=$\begin{bmatrix}-1.94 & 0.96 & -1.54\end{bmatrix}$

and direction d=$\begin{bmatrix}0.83 & -0.0 & 0.55\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}1.06 & 2.96 & 2.4\end{bmatrix}$
$\begin{bmatrix}-3.31 & -1.84 & -5.02\end{bmatrix}$
$\begin{bmatrix}1.06 & -0.31 & -4.15\end{bmatrix}$
$\begin{bmatrix}-3.75 & -0.75 & -2.62\end{bmatrix}$
$\begin{bmatrix}-1.13 & 1.87 & 1.31\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

320. Ray R has starting point e=$\begin{bmatrix}-7.76 & 1.34 & 1.0\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.0 & -1.0 & -0.0\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}4.94 & -2.8 & 4.47\end{bmatrix}$
$\begin{bmatrix}-3.08 & 0.14 & -2.74\end{bmatrix}$
$\begin{bmatrix}-0.14 & -0.93 & -0.07\end{bmatrix}$
$\begin{bmatrix}-0.94 & -0.4 & -0.07\end{bmatrix}$
$\begin{bmatrix}0.93 & 0.41 & 6.08\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

321. Ray R has starting point e=$\begin{bmatrix}-14.66 & 3.88 & 2.16\end{bmatrix}$
and direction d=$\begin{bmatrix}0.58 & -0.58 & -0.58\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-5.0 & -1.04 & -0.96\end{bmatrix}$
$\begin{bmatrix}-6.73 & 0.69 & -4.42\end{bmatrix}$
$\begin{bmatrix}-6.73 & 4.73 & -8.46\end{bmatrix}$
$\begin{bmatrix}-0.38 & 3.0 & -0.38\end{bmatrix}$
$\begin{bmatrix}-0.96 & 1.85 & 0.2\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

322. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 3) in a 535 x 469 image with the following parameters? l=-3, r=-2, b=-5, t=-4 view type = perspective
camera origin = $\begin{bmatrix}-5.0 & 2.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.65 & 0.39 & -0.65\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.89 & 0.0 & 0.45\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.78 & 0.2 & 0.59\end{bmatrix}$
image plane at distance 3 in front of viewpoint

323. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 0) in a 411 x 297 image with the following parameters? l=-3, r=4, b=2, t=3 view type = perspective
camera origin = $\begin{bmatrix}-4.0 & -2.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.22 & 0.87 & 0.44\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.62 & -0.15 & -0.77\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.41 & 0.41 & -0.82\end{bmatrix}$
image plane at distance 2 in front of viewpoint

324. Ray R has starting point e=$\begin{bmatrix}-3.13 & -1.67 & 5.14\end{bmatrix}$
and direction d=$\begin{bmatrix}0.33 & -0.67 & -0.67\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-0.94 & -5.12 & 5.5\end{bmatrix}$
$\begin{bmatrix}-3.28 & -1.22 & 2.38\end{bmatrix}$
$\begin{bmatrix}-5.47 & -0.44 & 1.75\end{bmatrix}$
$\begin{bmatrix}-7.34 & -2.78 & 3.62\end{bmatrix}$
$\begin{bmatrix}-8.9 & -5.9 & 6.12\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

325. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 0) in a 528 x 492 image with the following parameters? l=-4, r=-1, b=-2, t=4 view type = perspective
camera origin = $\begin{bmatrix}0.0 & 2.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.83 & -0.55 & 0.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & -0.93 & 0.37\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.37 & 0.0 & -0.93\end{bmatrix}$
image plane at distance 0 in front of viewpoint

326. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 2) in a 543 x 414 image with the following parameters? l=-2, r=0, b=-1, t=0 view type = orthographic
camera origin = $\begin{bmatrix}3.0 & 4.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.7 & 0.17 & 0.7\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.42 & -0.57 & -0.71\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.83 & -0.55 & 0.0\end{bmatrix}$

327. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 0) in a 427 x 569 image with the following parameters? l=-5, r=4, b=-4, t=2 view type = orthographic
camera origin = $\begin{bmatrix}1.0 & -2.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.69 & -0.23 & -0.69\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.89 & -0.45 & 0.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.69 & 0.23 & -0.69\end{bmatrix}$

328. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 3) in a 662 x 266 image with the following parameters? l=-5, r=-4, b=-2, t=2 view type = perspective
camera origin = $\begin{bmatrix}-5.0 & -1.0 & -5.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.68 & -0.68 & -0.27\end{bmatrix}$

camera v axis = $\begin{bmatrix}0.9 & 0.3 & -0.3\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.37 & -0.56 & -0.74\end{bmatrix}$
image plane at distance 2 in front of viewpoint

329. Ray R has starting point e=$\begin{bmatrix}-3.79 & -5.9 & -1.66\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.62 & 0.62 & 0.47\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-5.0 & -3.0 & -2.0\end{bmatrix}$
$\begin{bmatrix}-5.0 & -4.0 & 1.0\end{bmatrix}$
$\begin{bmatrix}-5.0 & -6.0 & 0.0\end{bmatrix}$
$\begin{bmatrix}-5.0 & -9.0 & -3.0\end{bmatrix}$
$\begin{bmatrix}-5.0 & -8.0 & -6.0\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

330. Ray R has starting point e=$\begin{bmatrix}-3.57 & -6.69 & 1.1\end{bmatrix}$
and direction d=$\begin{bmatrix}0.62 & 0.62 & -0.47\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}2.2 & -7.7 & 1.87\end{bmatrix}$
$\begin{bmatrix}-2.54 & -1.45 & -3.03\end{bmatrix}$
$\begin{bmatrix}-1.01 & -2.8 & 0.52\end{bmatrix}$
$\begin{bmatrix}0.34 & -5.51 & -0.83\end{bmatrix}$
$\begin{bmatrix}-2.37 & -1.96 & -3.7\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

331. Ray R has starting point e=$\begin{bmatrix}2.98 & 3.55 & -4.04\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.67 & -0.67 & -0.33\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}0.58 & 1.85 & -5.84\end{bmatrix}$
$\begin{bmatrix}2.7 & 3.12 & -4.0\end{bmatrix}$
$\begin{bmatrix}3.83 & 4.11 & -3.43\end{bmatrix}$
$\begin{bmatrix}2.98 & 6.23 & -7.68\end{bmatrix}$
$\begin{bmatrix}4.54 & 5.1 & -3.58\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

332. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 1) in a 301 x 411 image with the following parameters? l=-5, r=-4, b=1, t=3 view type = perspective camera origin = $\begin{bmatrix}-5.0 & 2.0 & -5.0\end{bmatrix}$

camera u axis = $\begin{bmatrix}-0.3 & -0.3 & -0.9\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & -0.97 & -0.24\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.0 & 0.45 & 0.89\end{bmatrix}$
image plane at distance 4 in front of viewpoint

333. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 3) in a 381 x 722 image with the following parameters? l=0, r=1, b=-2, t=3 view type = perspective
camera origin = $\begin{bmatrix}0.0 & 2.0 & 2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.93 & -0.37 & 0.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.82 & -0.41 & 0.41\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.0 & 0.95 & 0.32\end{bmatrix}$
image plane at distance 2 in front of viewpoint

334. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 2) in a 579 x 472 image with the following parameters? l=-2, r=1, b=0, t=3 view type = orthographic
camera origin = $\begin{bmatrix}-3.0 & 2.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.27 & -0.8 & 0.53\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.71 & -0.57 & -0.42\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.49 & -0.49 & -0.73\end{bmatrix}$

335. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 4) in a 548 x 581 image with the following parameters? l=-4, r=3, b=-5, t=-4 view type = orthographic
camera origin = $\begin{bmatrix}-5.0 & -1.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.18 & 0.37 & -0.91\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.6 & -0.8 & 0.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.41 & -0.82 & 0.41\end{bmatrix}$

336. Ray R has starting point e=$\begin{bmatrix}-6.6 & -8.12 & 0.03\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.7 & 0.7 & 0.17\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}3.0 & -4.11 & -3.21\end{bmatrix}$
$\begin{bmatrix}7.92 & -4.11 & -3.21\end{bmatrix}$
$\begin{bmatrix}9.26 & -3.66 & -2.32\end{bmatrix}$
$\begin{bmatrix}6.58 & -3.66 & -2.32\end{bmatrix}$
$\begin{bmatrix}-2.37 & -5.0 & -5.0\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

337. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 4) in a 644 x 726 image with the following parameters? l=-3, r=-2, b=-5, t=3 view type = perspective
camera origin = $\begin{bmatrix}-3.0 & -5.0 & 4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.56 & 0.37 & -0.74\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.71 & 0.71 & 0.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.74 & 0.37 & -0.56\end{bmatrix}$
image plane at distance 3 in front of viewpoint

338. Ray R has starting point e=$\begin{bmatrix}-16.13 & -0.2 & 1.51\end{bmatrix}$ and direction d=$\begin{bmatrix}0.67 & -0.67 & -0.33\end{bmatrix}$ . Polygon P has vertices $\begin{bmatrix}-6.39 & -4.11 & -3.66\end{bmatrix}$ $\begin{bmatrix}-7.77 & -4.11 & -3.66\end{bmatrix}$ $\begin{bmatrix}-8.05 & -1.34 & 0.5\end{bmatrix}$ $\begin{bmatrix}-5.55 & -0.78 & 1.33\end{bmatrix}$ $\begin{bmatrix}-8.61 & -3.0 & -2.0\end{bmatrix}$ .
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

339. Ray R has starting point e=$\begin{bmatrix}1.59 & 0.19 & -4.55\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.37 & 0.74 & 0.56\end{bmatrix}$ . Polygon P has vertices $\begin{bmatrix}1.2 & 2.4 & -4.8\end{bmatrix}$ $\begin{bmatrix}-0.8 & 3.2 & -5.4\end{bmatrix}$ $\begin{bmatrix}3.4 & -4.0 & 0.0\end{bmatrix}$ $\begin{bmatrix}7.4 & 3.2 & -5.4\end{bmatrix}$ $\begin{bmatrix}-2.6 & 0.0 & -3.0\end{bmatrix}$ .
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

340. Ray R has starting point e=$\begin{bmatrix}-16.37 & 0.65 & 1.94\end{bmatrix}$ and direction d=$\begin{bmatrix}0.81 & 0.49 & -0.32\end{bmatrix}$ . Polygon P has vertices $\begin{bmatrix}-3.46 & -0.31 & 3.15\end{bmatrix}$ $\begin{bmatrix}-3.46 & -0.31 & 3.15\end{bmatrix}$ $\begin{bmatrix}-4.04 & 0.85 & 4.89\end{bmatrix}$ $\begin{bmatrix}-1.73 & 2.58 & 4.31\end{bmatrix}$ $\begin{bmatrix}0.58 & 2.0 & 1.42\end{bmatrix}$ .
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

341. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 0) in a 583 x 522 image with the following parameters? l=-2, r=3, b=-5, t=-2 view type = perspective camera origin = $\begin{bmatrix}0.0 & -2.0 & -3.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.53 & -0.8 & -0.27\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.24 & -0.24 & -0.94\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.64 & -0.64 & 0.43\end{bmatrix}$ image plane at distance 1 in front of viewpoint

342. Ray R has starting point e=$\begin{bmatrix}-9.99 & -3.04 & 2.02\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.73 & -0.49 & -0.49\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}3.67 & -1.12 & -2.37\end{bmatrix}$ $\begin{bmatrix}4.88 & -5.24 & -0.43\end{bmatrix}$ $\begin{bmatrix}2.94 & -5.49 & 1.03\end{bmatrix}$ $\begin{bmatrix}1.97 & -3.79 & 0.54\end{bmatrix}$ $\begin{bmatrix}-2.4 & -5.24 & 4.43\end{bmatrix}$.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

343. Ray R has starting point e=$\begin{bmatrix}-3.81 & 2.94 & 0.34\end{bmatrix}$ and direction d=$\begin{bmatrix}0.62 & -0.15 & 0.77\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}0.49 & 2.46 & -5.78\end{bmatrix}$ $\begin{bmatrix}-1.62 & 3.6 & -3.03\end{bmatrix}$ $\begin{bmatrix}-1.62 & -1.76 & 0.54\end{bmatrix}$ $\begin{bmatrix}0.49 & -0.46 & -3.84\end{bmatrix}$ $\begin{bmatrix}1.14 & 4.73 & -8.38\end{bmatrix}$.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

344. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 4) in a 325 x 287 image with the following parameters? l=-2, r=1, b=-2, t=2 view type = orthographic
camera origin = $\begin{bmatrix}4.0 & 4.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.0 & -0.8 & -0.6\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.33 & 0.67 & -0.67\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.81 & -0.32 & 0.49\end{bmatrix}$

345. Ray R has starting point e=$\begin{bmatrix}-1.9 & -2.12 & 2.52\end{bmatrix}$ and direction d=$\begin{bmatrix}0.62 & -0.62 & 0.47\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-3.29 & -4.71 & 0.29\end{bmatrix}$ $\begin{bmatrix}1.66 & -2.59 & 2.41\end{bmatrix}$ $\begin{bmatrix}-2.59 & -1.17 & 3.83\end{bmatrix}$ $\begin{bmatrix}-0.46 & -0.46 & 4.54\end{bmatrix}$ $\begin{bmatrix}-3.29 & -1.88 & 3.12\end{bmatrix}$.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

346. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 2) in a 581 x 546 image with the following parameters? l=-3, r=-2, b=-3, t=3 view type = orthographic
camera origin = $\begin{bmatrix}-4.0 & 1.0 & 4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.53 & -0.27 & -0.8\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.43 & -0.64 & -0.64\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.51 & -0.69 & 0.51\end{bmatrix}$

347. Ray R has starting point e=$\begin{bmatrix}-2.99 & -6.09 & 0.67\end{bmatrix}$
and direction d=$\begin{bmatrix}0.81 & 0.49 & 0.32\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-0.91 & -5.65 & 2.9\end{bmatrix}$
$\begin{bmatrix}-2.01 & -2.55 & 3.09\end{bmatrix}$
$\begin{bmatrix}-0.73 & -5.1 & 3.09\end{bmatrix}$
$\begin{bmatrix}3.65 & -5.65 & 4.73\end{bmatrix}$
$\begin{bmatrix}4.38 & -3.46 & 5.46\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

348. Ray R has starting point e=$\begin{bmatrix}2.38 & -3.03 & 2.27\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.17 & 0.85 & 0.51\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}3.03 & 0.37 & -1.74\end{bmatrix}$
$\begin{bmatrix}3.03 & -2.37 & 1.0\end{bmatrix}$
$\begin{bmatrix}0.97 & -4.26 & 5.63\end{bmatrix}$
$\begin{bmatrix}1.49 & -0.14 & 0.83\end{bmatrix}$
$\begin{bmatrix}3.03 & -0.66 & -0.71\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

349. Ray R has starting point e=$\begin{bmatrix}2.43 & -3.65 & -0.3\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.58 & 0.58 & 0.58\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}0.0 & -1.0 & 3.0\end{bmatrix}$
$\begin{bmatrix}-7.0 & 2.0 & 3.0\end{bmatrix}$
$\begin{bmatrix}-6.0 & 4.0 & 3.0\end{bmatrix}$
$\begin{bmatrix}-4.0 & 8.0 & 3.0\end{bmatrix}$
$\begin{bmatrix}-4.0 & 8.0 & 3.0\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

350. Ray R has starting point e=$\begin{bmatrix}-10.17 & -1.21 & -0.01\end{bmatrix}$ and direction d=$\begin{bmatrix}0.41 & 0.82 & 0.41\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}2.0 & 0.73 & 5.73\end{bmatrix}$ $\begin{bmatrix}2.58 & -1.0 & 4.58\end{bmatrix}$ $\begin{bmatrix}-2.04 & 0.73 & 1.69\end{bmatrix}$ $\begin{bmatrix}4.89 & 0.73 & 8.62\end{bmatrix}$ $\begin{bmatrix}0.27 & 1.31 & 4.58\end{bmatrix}$.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

351. Ray R has starting point e=$\begin{bmatrix}-1.04 & -1.33 & 1.63\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.82 & 0.41 & -0.41\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}3.97 & 0.33 & 0.21\end{bmatrix}$ $\begin{bmatrix}7.37 & -1.12 & -3.43\end{bmatrix}$ $\begin{bmatrix}4.46 & 2.27 & -2.46\end{bmatrix}$ $\begin{bmatrix}5.43 & 0.57 & -2.21\end{bmatrix}$ $\begin{bmatrix}1.54 & 5.67 & -1.49\end{bmatrix}$.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

352. Ray R has starting point e=$\begin{bmatrix}-8.17 & -3.1 & 2.67\end{bmatrix}$ and direction d=$\begin{bmatrix}0.78 & 0.2 & -0.59\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-5.96 & -0.73 & -3.31\end{bmatrix}$ $\begin{bmatrix}-3.56 & -3.78 & 0.18\end{bmatrix}$ $\begin{bmatrix}-4.22 & -1.38 & 2.36\end{bmatrix}$ $\begin{bmatrix}-6.18 & 0.15 & -2.44\end{bmatrix}$ $\begin{bmatrix}-3.35 & -4.87 & -1.13\end{bmatrix}$.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

353. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 1) in a 251 x 497 image with the following parameters? l=-3, r=-2, b=-4, t=-1 view type = orthographic camera origin = $\begin{bmatrix}-3.0 & 0.0 & -2.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.81 & -0.49 & 0.32\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.49 & -0.81 & -0.32\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.76 & -0.46 & 0.46\end{bmatrix}$

354. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 3) in a 513 x 307 image with the following parameters? l=-2, r=4, b=-4, t=-3 view type = orthographic
camera origin = $\begin{bmatrix}-4.0 & -4.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.78 & -0.59 & 0.2\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.35 & -0.35 & -0.87\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.58 & -0.58 & 0.58\end{bmatrix}$

355. Ray R has starting point e=$\begin{bmatrix}-2.33 & -3.96 & 0.58\end{bmatrix}$
and direction d=$\begin{bmatrix}0.59 & -0.2 & 0.78\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}7.1 & -5.96 & -0.39\end{bmatrix}$
$\begin{bmatrix}0.04 & -4.0 & 0.0\end{bmatrix}$
$\begin{bmatrix}-0.55 & -7.92 & -0.78\end{bmatrix}$
$\begin{bmatrix}0.04 & -4.0 & 0.0\end{bmatrix}$
$\begin{bmatrix}3.57 & -3.02 & 0.2\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

356. Ray R has starting point e=$\begin{bmatrix}4.86 & 2.1 & -0.58\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.58 & -0.58 & -0.58\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}4.44 & -5.09 & -0.35\end{bmatrix}$
$\begin{bmatrix}0.94 & -1.16 & -3.18\end{bmatrix}$
$\begin{bmatrix}2.25 & 0.8 & -3.84\end{bmatrix}$
$\begin{bmatrix}3.56 & -4.22 & -1.0\end{bmatrix}$
$\begin{bmatrix}6.18 & -5.96 & 0.53\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

357. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 4) in a 361 x 456 image with the following parameters? l=-1, r=2, b=-4, t=2 view type = perspective
camera origin = $\begin{bmatrix}-5.0 & -3.0 & 2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.87 & -0.35 & 0.35\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.74 & 0.56 & -0.37\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.56 & -0.74 & 0.37\end{bmatrix}$
image plane at distance 4 in front of viewpoint

358. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 2) in a 291 x 265 image with the following parameters? l=-4, r=2, b=-4, t=-3 view type = orthographic
camera origin = $\begin{bmatrix}2.0 & -4.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.47 & -0.62 & -0.62\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.19 & 0.19 & -0.96\end{bmatrix}$

camera w axis = $\begin{bmatrix}-0.37 & 0.74 & 0.56\end{bmatrix}$

359. Ray R has starting point e=$\begin{bmatrix}-4.67 & 0.35 & 1.0\end{bmatrix}$
and direction d=$\begin{bmatrix}0.97 & 0.24 & -0.0\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-1.06 & -1.77 & 4.18\end{bmatrix}$
$\begin{bmatrix}2.48 & 2.71 & 3.94\end{bmatrix}$
$\begin{bmatrix}-3.18 & 5.54 & 1.82\end{bmatrix}$
$\begin{bmatrix}2.24 & 3.41 & 3.71\end{bmatrix}$
$\begin{bmatrix}0.12 & 4.12 & 3.0\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

360. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 2) in a 725 x 493 image with the following parameters? l=-2, r=1, b=2, t=3 view type = perspective
camera origin = $\begin{bmatrix}-4.0 & 4.0 & 4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.8 & 0.6 & 0.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.53 & -0.27 & -0.8\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.0 & 1.0 & 0.0\end{bmatrix}$
image plane at distance 3 in front of viewpoint

361. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 3) in a 613 x 439 image with the following parameters? l=0, r=1, b=-1, t=4 view type = perspective
camera origin = $\begin{bmatrix}3.0 & 2.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.94 & 0.24 & -0.24\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.2 & 0.59 & 0.78\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.73 & -0.49 & -0.49\end{bmatrix}$
image plane at distance 0 in front of viewpoint

362. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 2) in a 533 x 354 image with the following parameters? l=-3, r=3, b=-3, t=4 view type = orthographic
camera origin = $\begin{bmatrix}1.0 & 4.0 & 2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.94 & -0.24 & 0.24\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.69 & 0.69 & -0.23\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.53 & -0.66 & 0.53\end{bmatrix}$

363. Ray R has starting point e=$\begin{bmatrix}5.63 & -1.38 & 2.26\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.0 & -0.0 & 1.0\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}6.12 & -0.71 & 3.2\end{bmatrix}$
$\begin{bmatrix}4.06 & -3.46 & 3.2\end{bmatrix}$
$\begin{bmatrix}3.54 & -4.66 & 3.71\end{bmatrix}$
$\begin{bmatrix}4.06 & 0.49 & -0.74\end{bmatrix}$
$\begin{bmatrix}2.51 & -8.09 & 5.77\end{bmatrix}$
.
b) What is the normal to P?

c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

364. Ray R has starting point e=$\begin{bmatrix}-1.15 & -4.11 & 1.23\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.0 & -0.0 & 1.0\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-0.82 & -4.41 & 3.39\end{bmatrix}$
$\begin{bmatrix}-2.39 & -2.45 & 6.53\end{bmatrix}$
$\begin{bmatrix}-4.75 & -3.04 & 6.53\end{bmatrix}$
$\begin{bmatrix}-4.35 & -6.18 & 2.22\end{bmatrix}$
$\begin{bmatrix}2.71 & -3.82 & 3.0\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

365. Ray R has starting point e=$\begin{bmatrix}2.89 & -4.62 & -2.63\end{bmatrix}$ and direction d=$\begin{bmatrix}0.64 & 0.64 & -0.43\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}3.67 & -4.04 & -2.86\end{bmatrix}$
$\begin{bmatrix}2.86 & -4.86 & -2.86\end{bmatrix}$
$\begin{bmatrix}1.63 & -5.27 & -2.45\end{bmatrix}$
$\begin{bmatrix}-2.86 & -5.67 & -0.41\end{bmatrix}$
$\begin{bmatrix}3.67 & -4.86 & -3.27\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

366. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 0) in a 664 x 470 image with the following parameters? l=1, r=4, b=-2, t=2 view type = perspective
camera origin = $\begin{bmatrix}1.0 & -4.0 & -5.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.3 & 0.3 & 0.9\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.53 & -0.27 & 0.8\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.33 & 0.67 & -0.67\end{bmatrix}$
image plane at distance 2 in front of viewpoint

367. Ray R has starting point e=$\begin{bmatrix}8.68 & -6.94 & -0.55\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.56 & 0.37 & 0.74\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}7.71 & -8.18 & 3.26\end{bmatrix}$
$\begin{bmatrix}4.53 & -5.0 & 2.47\end{bmatrix}$
$\begin{bmatrix}8.64 & -5.0 & -1.64\end{bmatrix}$
$\begin{bmatrix}3.07 & -4.47 & 3.26\end{bmatrix}$
$\begin{bmatrix}3.6 & -1.29 & -1.24\end{bmatrix}$
.

b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

368. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 4) in a 299 x 510 image with the following parameters? l=2, r=4, b=-5, t=1 view type = perspective camera origin = $\begin{bmatrix}-3.0 & -2.0 & 0.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.49 & -0.73 & -0.49\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.56 & -0.37 & 0.74\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.77 & 0.15 & -0.62\end{bmatrix}$
image plane at distance 1 in front of viewpoint

369. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 3) in a 670 x 559 image with the following parameters? l=-4, r=-2, b=-3, t=3 view type = perspective camera origin = $\begin{bmatrix}-1.0 & 4.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.0 & 0.8 & -0.6\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.64 & 0.64 & -0.43\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.41 & 0.82 & 0.41\end{bmatrix}$
image plane at distance 1 in front of viewpoint

370. Ray R has starting point e=$\begin{bmatrix}-3.07 & 4.19 & 0.94\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.0 & -0.97 & 0.24\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}2.14 & 5.5 & 0.86\end{bmatrix}$
$\begin{bmatrix}0.66 & 0.67 & -2.67\end{bmatrix}$
$\begin{bmatrix}6.6 & 2.16 & 2.53\end{bmatrix}$
$\begin{bmatrix}2.14 & -0.81 & -2.3\end{bmatrix}$
$\begin{bmatrix}1.77 & -0.26 & -2.3\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

371. Ray R has starting point e=$\begin{bmatrix}-14.54 & -1.41 & 0.0\end{bmatrix}$
and direction d=$\begin{bmatrix}0.96 & -0.19 & 0.19\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-6.94 & -0.59 & -3.34\end{bmatrix}$
$\begin{bmatrix}-2.4 & -3.53 & -3.6\end{bmatrix}$
$\begin{bmatrix}-0.53 & -5.67 & -0.93\end{bmatrix}$
$\begin{bmatrix}-3.73 & -3.0 & -2.53\end{bmatrix}$
$\begin{bmatrix}-4.53 & -3.53 & 0.67\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

372. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 1) in a 259 x 424 image with the following parameters? l=3, r=4, b=-1, t=3 view type = perspective
camera origin = $\begin{bmatrix}-1.0 & 2.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.85 & 0.17 & 0.51\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & -0.71 & 0.71\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.58 & -0.58 & -0.58\end{bmatrix}$
image plane at distance 1 in front of viewpoint

373. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 4) in a 659 x 290 image with the following parameters? l=0, r=3, b=-3, t=-2 view type = orthographic
camera origin = $\begin{bmatrix}0.0 & 3.0 & 4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.24 & 0.94 & -0.24\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.71 & 0.42 & -0.57\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.49 & 0.49 & -0.73\end{bmatrix}$

374. Ray R has starting point e=$\begin{bmatrix}-2.89 & -8.68 & -4.6\end{bmatrix}$
and direction d=$\begin{bmatrix}0.76 & 0.46 & 0.46\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-2.44 & -7.04 & -3.14\end{bmatrix}$
$\begin{bmatrix}0.96 & -3.5 & -5.31\end{bmatrix}$
$\begin{bmatrix}7.76 & -7.31 & 1.22\end{bmatrix}$
$\begin{bmatrix}5.04 & -6.77 & -0.41\end{bmatrix}$
$\begin{bmatrix}6.4 & -8.13 & 1.49\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

375. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 1) in a 668 x 740 image with the following parameters? l=0, r=4, b=-3, t=0 view type = orthographic
camera origin = $\begin{bmatrix}3.0 & -5.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.51 & -0.69 & -0.51\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.67 & 0.33 & 0.67\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.2 & 0.59 & 0.78\end{bmatrix}$

376. Ray R has starting point e=$\begin{bmatrix}-10.8 & -3.57 & 0.78\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.94 & 0.24 & 0.24\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-4.07 & -5.93 & 2.37\end{bmatrix}$
$\begin{bmatrix}-2.21 & -1.1 & 3.11\end{bmatrix}$
$\begin{bmatrix}-1.29 & -8.9 & 3.49\end{bmatrix}$
$\begin{bmatrix}-7.79 & -2.96 & 0.89\end{bmatrix}$
$\begin{bmatrix}-5.93 & -6.11 & 1.63\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?

e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

377. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 1) in a 571 x 538 image with the following parameters? l=0, r=4, b=0, t=4 view type = orthographic
camera origin = $\begin{bmatrix}-2.0 & -1.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.95 & 0.32 & 0.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.51 & 0.51 & 0.69\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.74 & -0.56 & 0.37\end{bmatrix}$

378. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 4) in a 388 x 626 image with the following parameters? l=-3, r=2, b=-2, t=3 view type = orthographic
camera origin = $\begin{bmatrix}-4.0 & -5.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.41 & -0.82 & -0.41\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.8 & -0.53 & 0.27\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.85 & 0.51 & -0.17\end{bmatrix}$

379. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 1) in a 632 x 606 image with the following parameters? l=-1, r=2, b=-2, t=1 view type = orthographic
camera origin = $\begin{bmatrix}-4.0 & 2.0 & 4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.22 & 0.44 & -0.87\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.8 & -0.27 & -0.53\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.41 & 0.82 & -0.41\end{bmatrix}$

380. Ray R has starting point e=$\begin{bmatrix}-10.13 & 5.47 & 1.0\end{bmatrix}$
and direction d=$\begin{bmatrix}0.71 & -0.71 & -0.0\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}2.62 & 3.42 & -8.04\end{bmatrix}$
$\begin{bmatrix}2.62 & 3.42 & -8.04\end{bmatrix}$
$\begin{bmatrix}-3.15 & 6.31 & -5.15\end{bmatrix}$
$\begin{bmatrix}-3.73 & 1.69 & 0.04\end{bmatrix}$
$\begin{bmatrix}-6.04 & 7.46 & -3.42\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

381. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 3) in a 676 x 444 image with the following parameters? l=2, r=4, b=-1, t=0 view type = perspective
camera origin = $\begin{bmatrix}4.0 & 3.0 & -5.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.87 & -0.44 & 0.22\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.78 & 0.0 & -0.62\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.78 & 0.0 & -0.62\end{bmatrix}$
image plane at distance 4 in front of viewpoint

382. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 3) in a 648 x 601 image with the following parameters? l=1, r=2, b=-5, t=3 view type = orthographic
camera origin = $\begin{bmatrix}1.0 & 2.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.0 & -1.0 & 0.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.66 & -0.53 & -0.53\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.33 & -0.67 & -0.67\end{bmatrix}$

383. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 1) in a 276 x 608 image with the following parameters? l=-2, r=-1, b=-2, t=3 view type = perspective
camera origin = $\begin{bmatrix}2.0 & 3.0 & 4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.3 & -0.9 & -0.3\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & -0.45 & -0.89\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.69 & 0.51 & 0.51\end{bmatrix}$
image plane at distance 0 in front of viewpoint

384. Ray R has starting point e=$\begin{bmatrix}-9.96 & 8.79 & 3.42\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.23 & -0.69 & -0.69\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}1.73 & 3.82 & 2.29\end{bmatrix}$
$\begin{bmatrix}-1.01 & 6.74 & -5.56\end{bmatrix}$
$\begin{bmatrix}0.82 & 5.64 & 1.37\end{bmatrix}$
$\begin{bmatrix}1.0 & 4.18 & -0.63\end{bmatrix}$
$\begin{bmatrix}2.1 & 2.17 & 0.83\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

385. Ray R has starting point e=$\begin{bmatrix}-3.33 & 1.84 & 1.08\end{bmatrix}$
and direction d=$\begin{bmatrix}0.53 & -0.27 & 0.8\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-3.09 & 1.91 & -2.74\end{bmatrix}$
$\begin{bmatrix}-1.08 & 2.1 & 0.37\end{bmatrix}$
$\begin{bmatrix}-3.09 & 0.09 & 6.39\end{bmatrix}$
$\begin{bmatrix}-2.9 & 1.37 & 0.37\end{bmatrix}$
$\begin{bmatrix}-4.0 & 0.45 & 2.74\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

386. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 1) in a 500 x 372 image with the following parameters? l=-1, r=2, b=-1, t=0 view type = perspective
camera origin = $\begin{bmatrix}-5.0 & 0.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.37 & -0.18 & -0.91\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.62 & 0.62 & 0.47\end{bmatrix}$

camera w axis = $\begin{bmatrix}0.57 & -0.42 & -0.71\end{bmatrix}$
image plane at distance 2 in front of viewpoint

387. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 4) in a 480 x 593 image with the following parameters? l=-1, r=4, b=-3, t=3 view type = orthographic
camera origin = $\begin{bmatrix}1.0 & 2.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.42 & 0.57 & -0.71\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.7 & -0.7 & -0.17\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.8 & 0.0 & 0.6\end{bmatrix}$

388. Ray R has starting point e=$\begin{bmatrix}6.22 & -3.64 & -3.08\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.24 & 0.24 & 0.94\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}5.61 & -2.61 & -1.91\end{bmatrix}$
$\begin{bmatrix}6.31 & -4.53 & -0.87\end{bmatrix}$
$\begin{bmatrix}3.87 & 1.74 & -4.35\end{bmatrix}$
$\begin{bmatrix}1.61 & 0.35 & -4.7\end{bmatrix}$
$\begin{bmatrix}7.87 & 4.0 & -3.65\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

389. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 3) in a 728 x 364 image with the following parameters? l=-2, r=0, b=-2, t=4 view type = perspective
camera origin = $\begin{bmatrix}1.0 & -2.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.97 & 0.0 & 0.24\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.32 & -0.95 & 0.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.27 & 0.53 & -0.8\end{bmatrix}$
image plane at distance 4 in front of viewpoint

390. Ray R has starting point e=$\begin{bmatrix}4.78 & -0.77 & 2.68\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.8 & 0.53 & 0.27\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}1.78 & 2.31 & 3.62\end{bmatrix}$
$\begin{bmatrix}3.34 & -1.28 & 4.87\end{bmatrix}$
$\begin{bmatrix}1.0 & 1.84 & 3.0\end{bmatrix}$
$\begin{bmatrix}-0.56 & 6.22 & 1.75\end{bmatrix}$
$\begin{bmatrix}1.78 & -1.9 & 3.62\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

391. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 1) in a 276 x 657 image with the following parameters? l=-2, r=-1, b=-3, t=3 view type = orthographic
camera origin = $\begin{bmatrix}-3.0 & -3.0 & 3.0\end{bmatrix}$

camera u axis = $\begin{bmatrix}0.0 & -0.86 & 0.51\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.73 & -0.49 & -0.49\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.87 & -0.44 & -0.22\end{bmatrix}$

392. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 2) in a 470 x 313 image with the following parameters? l=-4, r=1, b=-3, t=-2 view type = perspective
camera origin = $\begin{bmatrix}3.0 & -3.0 & 2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.51 & -0.51 & 0.69\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.49 & -0.49 & 0.73\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.0 & 0.51 & -0.86\end{bmatrix}$
image plane at distance 0 in front of viewpoint

393. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 4) in a 445 x 639 image with the following parameters? l=-3, r=-2, b=-4, t=2 view type = orthographic
camera origin = $\begin{bmatrix}3.0 & -1.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.73 & -0.49 & -0.49\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.41 & 0.41 & 0.82\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.27 & 0.53 & -0.8\end{bmatrix}$

394. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 1) in a 748 x 459 image with the following parameters? l=1, r=2, b=1, t=2 view type = perspective
camera origin = $\begin{bmatrix}4.0 & 3.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.44 & -0.87 & 0.22\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.58 & 0.58 & 0.58\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.42 & -0.57 & -0.71\end{bmatrix}$
image plane at distance 0 in front of viewpoint

395. Ray R has starting point e=$\begin{bmatrix}-8.43 & 8.31 & -1.05\end{bmatrix}$
and direction d=$\begin{bmatrix}0.64 & -0.43 & 0.64\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}0.79 & 0.76 & 2.11\end{bmatrix}$
$\begin{bmatrix}-0.11 & 4.79 & 2.55\end{bmatrix}$
$\begin{bmatrix}2.58 & 7.02 & 1.21\end{bmatrix}$
$\begin{bmatrix}-2.79 & 4.79 & 3.89\end{bmatrix}$
$\begin{bmatrix}3.47 & 1.66 & 0.76\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

396. Ray R has starting point e=$\begin{bmatrix}-1.47 & -7.12 & 1.36\end{bmatrix}$
and direction d=$\begin{bmatrix}0.27 & 0.68 & 0.68\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-0.27 & -2.69 & 5.31\end{bmatrix}$
$\begin{bmatrix}1.25 & -2.91 & 3.13\end{bmatrix}$
$\begin{bmatrix}0.38 & -3.13 & 5.75\end{bmatrix}$
$\begin{bmatrix}3.22 & -4.65 & 6.18\end{bmatrix}$
$\begin{bmatrix}5.62 & -6.62 & 9.24\end{bmatrix}$

.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

397. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 1) in a 427 x 346 image with the following parameters? l=2, r=4, b=3, t=4 view type = perspective camera origin = $\begin{bmatrix}1.0 & -2.0 & 0.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.98 & 0.0 & -0.2\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.64 & -0.43 & -0.64\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.0 & 0.24 & -0.97\end{bmatrix}$
image plane at distance 3 in front of viewpoint

398. Ray R has starting point e=$\begin{bmatrix}-10.62 & -1.72 & 1.71\end{bmatrix}$
and direction d=$\begin{bmatrix}0.8 & -0.53 & -0.27\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-5.61 & -3.29 & 2.2\end{bmatrix}$
$\begin{bmatrix}-5.46 & -3.74 & 3.12\end{bmatrix}$
$\begin{bmatrix}-1.8 & -0.09 & 0.68\end{bmatrix}$
$\begin{bmatrix}-5.3 & -1.46 & -0.54\end{bmatrix}$
$\begin{bmatrix}-1.34 & -0.09 & 1.13\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

399. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 3) in a 656 x 361 image with the following parameters? l=-5, r=1, b=-3, t=2 view type = orthographic camera origin = $\begin{bmatrix}2.0 & 4.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.74 & -0.56 & 0.37\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.32 & 0.49 & -0.81\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.0 & 1.0 & 0.0\end{bmatrix}$

400. Ray R has starting point e=$\begin{bmatrix}-5.51 & 6.27 & 0.72\end{bmatrix}$
and direction d=$\begin{bmatrix}0.3 & -0.3 & 0.9\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-1.52 & 3.49 & 2.7\end{bmatrix}$
$\begin{bmatrix}2.03 & 4.51 & -3.55\end{bmatrix}$
$\begin{bmatrix}1.52 & 6.54 & -3.38\end{bmatrix}$
$\begin{bmatrix}0.0 & 2.48 & 0.51\end{bmatrix}$
$\begin{bmatrix}-1.69 & 3.32 & 3.04\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?

f) Is the intersection point in front of the viewpoint e?

401. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 3) in a 516 x 666 image with the following parameters? l=4, r=5, b=-5, t=-4 view type = orthographic camera origin = $\begin{bmatrix}1.0 & 1.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.75 & -0.3 & -0.6\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & -1.0 & 0.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.58 & -0.58 & 0.58\end{bmatrix}$

402. Ray R has starting point e=$\begin{bmatrix}0.2 & -6.07 & 3.26\end{bmatrix}$
and direction d=$\begin{bmatrix}0.7 & 0.7 & -0.14\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}3.62 & -2.22 & 0.66\end{bmatrix}$
$\begin{bmatrix}0.5 & -6.12 & 2.53\end{bmatrix}$
$\begin{bmatrix}1.75 & -4.56 & 5.19\end{bmatrix}$
$\begin{bmatrix}1.13 & -5.34 & 1.13\end{bmatrix}$
$\begin{bmatrix}3.0 & -3.0 & 1.28\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

403. Ray R has starting point e=$\begin{bmatrix}-4.1 & 4.25 & -0.76\end{bmatrix}$
and direction d=$\begin{bmatrix}0.41 & -0.82 & 0.41\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}6.8 & 1.4 & -1.8\end{bmatrix}$
$\begin{bmatrix}2.6 & -2.8 & -7.4\end{bmatrix}$
$\begin{bmatrix}4.0 & -1.6 & -5.8\end{bmatrix}$
$\begin{bmatrix}1.2 & 0.2 & -3.4\end{bmatrix}$
$\begin{bmatrix}2.0 & -2.8 & -7.4\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

404. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 3) in a 668 x 620 image with the following parameters? l=1, r=4, b=3, t=4 view type = orthographic camera origin = $\begin{bmatrix}2.0 & -4.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.71 & 0.57 & -0.42\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.67 & 0.33 & 0.67\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.56 & 0.74 & -0.37\end{bmatrix}$

405. Ray R has starting point e=$\begin{bmatrix}-3.74 & 5.75 & 2.87\end{bmatrix}$
and direction d=$\begin{bmatrix}0.87 & -0.22 & -0.44\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}3.0 & 6.24 & -4.0\end{bmatrix}$
$\begin{bmatrix}0.17 & 1.29 & -6.83\end{bmatrix}$

$\begin{bmatrix}1.59 & 3.41 & -5.41\end{bmatrix}$
$\begin{bmatrix}2.29 & -0.83 & -4.71\end{bmatrix}$
$\begin{bmatrix}4.41 & 4.83 & -2.59\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

406. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 1) in a 391 x 670 image with the following parameters? l=-2, r=1, b=0, t=1 view type = perspective camera origin = $\begin{bmatrix}1.0 & 2.0 & 4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.78 & 0.59 & -0.2\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.87 & -0.44 & -0.22\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.8 & -0.6 & 0.0\end{bmatrix}$
image plane at distance 3 in front of viewpoint

407. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 2) in a 729 x 430 image with the following parameters? l=-2, r=3, b=-1, t=1 view type = orthographic camera origin = $\begin{bmatrix}-1.0 & -3.0 & 2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.59 & -0.2 & 0.78\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.9 & 0.3 & 0.3\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.23 & 0.69 & 0.69\end{bmatrix}$

408. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 0) in a 746 x 313 image with the following parameters? l=-5, r=4, b=-5, t=3 view type = perspective camera origin = $\begin{bmatrix}1.0 & -2.0 & 4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.7 & 0.7 & -0.17\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & -0.6 & -0.8\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.62 & -0.49 & -0.62\end{bmatrix}$
image plane at distance 4 in front of viewpoint

409. Ray R has starting point e=$\begin{bmatrix}-10.94 & 0.96 & -1.6\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.69 & 0.23 & 0.69\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-1.0 & -1.35 & 2.14\end{bmatrix}$
$\begin{bmatrix}-4.33 & 1.78 & -3.16\end{bmatrix}$
$\begin{bmatrix}-0.8 & 0.02 & 0.37\end{bmatrix}$
$\begin{bmatrix}-1.0 & -0.18 & 0.57\end{bmatrix}$
$\begin{bmatrix}-2.18 & 3.35 & -4.53\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

410. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 0) in a 401 x 676 image with the following parameters? l=-5, r=4, b=-3, t=3 view type = perspective

camera origin = $\begin{bmatrix}1.0 & 4.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.37 & -0.56 & -0.74\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.45 & 0.0 & -0.89\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.42 & 0.57 & -0.71\end{bmatrix}$
image plane at distance 3 in front of viewpoint

411. Ray R has starting point e=$\begin{bmatrix}-11.23 & 0.94 & 0.73\end{bmatrix}$
and direction d=$\begin{bmatrix}0.55 & -0.0 & 0.83\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-2.2 & -1.27 & -2.0\end{bmatrix}$
$\begin{bmatrix}-0.33 & -0.47 & -4.14\end{bmatrix}$
$\begin{bmatrix}-3.27 & -0.2 & -3.07\end{bmatrix}$
$\begin{bmatrix}-4.07 & 1.14 & -4.67\end{bmatrix}$
$\begin{bmatrix}-1.93 & -0.47 & -3.34\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

412. Ray R has starting point e=$\begin{bmatrix}-6.04 & 7.14 & 1.11\end{bmatrix}$
and direction d=$\begin{bmatrix}0.78 & -0.0 & -0.62\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-3.67 & 8.67 & 1.33\end{bmatrix}$
$\begin{bmatrix}-4.33 & 9.33 & 1.67\end{bmatrix}$
$\begin{bmatrix}0.67 & 6.0 & -1.67\end{bmatrix}$
$\begin{bmatrix}-1.67 & 0.0 & 3.67\end{bmatrix}$
$\begin{bmatrix}4.67 & 0.0 & -2.67\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

413. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 1) in a 425 x 427 image with the following parameters? l=-5, r=-1, b=0, t=4 view type = orthographic
camera origin = $\begin{bmatrix}-3.0 & -1.0 & 4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.91 & -0.37 & 0.18\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.86 & -0.51 & 0.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.22 & -0.44 & 0.87\end{bmatrix}$

414. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 3) in a 558 x 574 image with the following parameters? l=-2, r=1, b=-1, t=2 view type = orthographic
camera origin = $\begin{bmatrix}-2.0 & 3.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.24 & 0.24 & -0.94\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & 0.71 & -0.71\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.93 & 0.37 & 0.0\end{bmatrix}$

415. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 3) in a 250 x 401 image with the following parameters? l=1, r=2, b=-3, t=2 view type = perspective
camera origin = $\begin{bmatrix}-2.0 & -1.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.65 & -0.65 & 0.39\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.3 & -0.3 & 0.9\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.24 & 0.0 & 0.97\end{bmatrix}$
image plane at distance 3 in front of viewpoint

416. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 2) in a 488 x 496 image with the following parameters? l=3, r=4, b=-3, t=-2 view type = perspective
camera origin = $\begin{bmatrix}3.0 & 0.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.2 & -0.78 & 0.59\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.68 & 0.27 & -0.68\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.7 & -0.7 & 0.14\end{bmatrix}$
image plane at distance 0 in front of viewpoint

417. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 0) in a 518 x 581 image with the following parameters? l=-4, r=2, b=-3, t=4 view type = orthographic
camera origin = $\begin{bmatrix}-3.0 & 4.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.41 & 0.82 & -0.41\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.89 & 0.0 & -0.45\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.0 & 0.0 & -1.0\end{bmatrix}$

418. Ray R has starting point e=$\begin{bmatrix}-12.44 & -1.85 & 1.41\end{bmatrix}$
and direction d=$\begin{bmatrix}0.47 & -0.62 & -0.62\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-4.22 & 0.24 & 5.6\end{bmatrix}$
$\begin{bmatrix}0.32 & -4.78 & 0.24\end{bmatrix}$
$\begin{bmatrix}-0.65 & -4.3 & 0.4\end{bmatrix}$
$\begin{bmatrix}3.57 & -2.19 & 6.73\end{bmatrix}$
$\begin{bmatrix}-1.3 & -0.24 & 6.73\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

419. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 1) in a 336 x 472 image with the following parameters? l=1, r=4, b=0, t=2 view type = perspective
camera origin = $\begin{bmatrix}0.0 & 2.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.56 & -0.37 & -0.74\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.67 & -0.67 & 0.33\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.69 & -0.23 & -0.69\end{bmatrix}$
image plane at distance 3 in front of viewpoint

420. Ray R has starting point e=$\begin{bmatrix}9.02 & -2.05 & 5.29\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.56 & 0.37 & -0.74\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}6.12 & -0.88 & 2.29\end{bmatrix}$
$\begin{bmatrix}7.54 & 0.54 & -1.24\end{bmatrix}$

$\begin{bmatrix}6.83 & -0.17 & 2.29\end{bmatrix}$
$\begin{bmatrix}1.88 & -5.12 & -1.24\end{bmatrix}$
$\begin{bmatrix}3.29 & -3.71 & 1.59\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

421. Ray R has starting point e=$\begin{bmatrix}1.07 & 1.38 & -5.13\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.56 & 0.74 & -0.37\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}1.41 & 3.63 & -1.14\end{bmatrix}$
$\begin{bmatrix}1.0 & 2.82 & -2.37\end{bmatrix}$
$\begin{bmatrix}1.0 & -0.04 & -8.08\end{bmatrix}$
$\begin{bmatrix}-1.45 & -0.86 & -7.27\end{bmatrix}$
$\begin{bmatrix}-0.63 & 3.63 & 0.9\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

422. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 4) in a 597 x 350 image with the following parameters? l=-5, r=-1, b=-5, t=-2 view type = perspective
camera origin = $\begin{bmatrix}-4.0 & -5.0 & 0.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.71 & 0.0 & -0.71\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.17 & -0.51 & -0.85\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.69 & 0.23 & -0.69\end{bmatrix}$
image plane at distance 3 in front of viewpoint

423. Ray R has starting point e=$\begin{bmatrix}-7.88 & -2.09 & 1.28\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.45 & -0.0 & 0.89\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-10.88 & -1.73 & 4.14\end{bmatrix}$
$\begin{bmatrix}-6.07 & -4.14 & 0.93\end{bmatrix}$
$\begin{bmatrix}-9.28 & -1.73 & 3.6\end{bmatrix}$
$\begin{bmatrix}-5.8 & 1.21 & 4.41\end{bmatrix}$
$\begin{bmatrix}-9.28 & 0.67 & 5.21\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

424. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 4) in a 406 x 556 image with the following parameters? l=-4, r=4, b=-2, t=1 view type = orthographic
camera origin = $\begin{bmatrix}2.0 & 4.0 & 4.0\end{bmatrix}$

camera u axis = $\begin{bmatrix}-0.77 & 0.15 & 0.62\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.69 & 0.51 & 0.51\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.47 & -0.62 & 0.62\end{bmatrix}$

425. Ray R has starting point e=$\begin{bmatrix}-13.7 & 2.19 & 2.78\end{bmatrix}$
and direction d=$\begin{bmatrix}0.69 & 0.23 & -0.69\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-6.0 & 5.4 & 5.2\end{bmatrix}$
$\begin{bmatrix}-1.2 & 0.0 & -2.0\end{bmatrix}$
$\begin{bmatrix}-1.6 & 5.4 & 5.2\end{bmatrix}$
$\begin{bmatrix}1.8 & 3.0 & 2.0\end{bmatrix}$
$\begin{bmatrix}-4.6 & 3.0 & 2.0\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

426. Ray R has starting point e=$\begin{bmatrix}-9.4 & 2.26 & -3.34\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.35 & -0.35 & 0.87\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-1.78 & -0.13 & -5.0\end{bmatrix}$
$\begin{bmatrix}-4.4 & -1.44 & -9.58\end{bmatrix}$
$\begin{bmatrix}-1.78 & 5.55 & -7.84\end{bmatrix}$
$\begin{bmatrix}-2.44 & -1.87 & -5.44\end{bmatrix}$
$\begin{bmatrix}0.18 & 3.8 & -3.04\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

427. Ray R has starting point e=$\begin{bmatrix}-9.47 & 1.27 & 1.0\end{bmatrix}$
and direction d=$\begin{bmatrix}0.55 & -0.83 & -0.0\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-4.21 & -1.91 & -2.73\end{bmatrix}$
$\begin{bmatrix}-3.49 & -0.94 & -2.49\end{bmatrix}$
$\begin{bmatrix}-3.0 & 1.97 & -1.76\end{bmatrix}$
$\begin{bmatrix}-5.43 & 0.03 & -2.24\end{bmatrix}$
$\begin{bmatrix}-3.0 & -0.94 & -2.49\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

428. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 3) in a 518 x 251 image with the following parameters? l=-3, r=-2, b=-5, t=-1 view type = perspective

camera origin = $\begin{bmatrix}-5.0 & 1.0 & 2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.17 & -0.7 & -0.7\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.46 & -0.46 & -0.76\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.32 & 0.0 & -0.95\end{bmatrix}$
image plane at distance 2 in front of viewpoint

429. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 4) in a 553 x 374 image with the following parameters? l=0, r=2, b=-4, t=4 view type = orthographic
camera origin = $\begin{bmatrix}3.0 & 3.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.42 & -0.71 & 0.57\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & 0.0 & -1.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.45 & -0.89 & 0.0\end{bmatrix}$

430. Ray R has starting point e=$\begin{bmatrix}-7.99 & -1.33 & 0.09\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.82 & 0.41 & 0.41\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-3.31 & -1.23 & -8.09\end{bmatrix}$
$\begin{bmatrix}-0.85 & -1.85 & -4.85\end{bmatrix}$
$\begin{bmatrix}0.39 & -1.23 & -3.46\end{bmatrix}$
$\begin{bmatrix}-0.07 & 0.78 & -4.54\end{bmatrix}$
$\begin{bmatrix}-0.85 & -1.85 & -4.85\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

431. Ray R has starting point e=$\begin{bmatrix}-8.63 & 6.25 & 0.54\end{bmatrix}$
and direction d=$\begin{bmatrix}0.44 & 0.87 & 0.22\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-2.96 & 2.56 & -7.71\end{bmatrix}$
$\begin{bmatrix}-2.31 & 8.24 & -9.24\end{bmatrix}$
$\begin{bmatrix}-2.96 & 3.87 & -8.36\end{bmatrix}$
$\begin{bmatrix}0.09 & 0.38 & -0.51\end{bmatrix}$
$\begin{bmatrix}-3.84 & 0.38 & -8.36\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

432. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 1) in a 498 x 688 image with the following parameters? l=1, r=3, b=-5, t=2 view type = perspective
camera origin = $\begin{bmatrix}-4.0 & 2.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.51 & -0.51 & -0.69\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.82 & 0.41 & -0.41\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.2 & 0.59 & 0.78\end{bmatrix}$
image plane at distance 0 in front of viewpoint

433. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 4) in a 375 x 733 image with the following parameters? l=-2, r=4, b=-2, t=0 view type = orthographic
camera origin = $\begin{bmatrix}2.0 & -2.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.59 & -0.2 & -0.78\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.95 & -0.32 & 0.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.0 & -0.45 & 0.89\end{bmatrix}$

434. Ray R has starting point e=$\begin{bmatrix}-3.19 & 3.69 & 1.88\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.0 & -0.24 & -0.97\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}0.35 & 3.53 & 3.8\end{bmatrix}$
$\begin{bmatrix}-0.75 & 3.09 & -0.13\end{bmatrix}$
$\begin{bmatrix}2.75 & 2.0 & 2.49\end{bmatrix}$
$\begin{bmatrix}2.53 & 2.22 & 2.93\end{bmatrix}$
$\begin{bmatrix}3.4 & 0.69 & -1.44\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

435. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 2) in a 428 x 675 image with the following parameters? l=-3, r=-1, b=-5, t=4 view type = orthographic
camera origin = $\begin{bmatrix}2.0 & 1.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.78 & -0.59 & 0.2\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & -0.71 & -0.71\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.2 & 0.78 & 0.59\end{bmatrix}$

436. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 1) in a 289 x 276 image with the following parameters? l=-1, r=1, b=-2, t=-1 view type = perspective
camera origin = $\begin{bmatrix}-4.0 & -1.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.49 & -0.73 & -0.49\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.41 & 0.41 & 0.82\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.57 & -0.42 & -0.71\end{bmatrix}$
image plane at distance 1 in front of viewpoint

437. Ray R has starting point e=$\begin{bmatrix}-6.17 & -5.28 & -5.23\end{bmatrix}$
and direction d=$\begin{bmatrix}0.49 & -0.32 & 0.81\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-7.08 & -5.96 & -4.41\end{bmatrix}$
$\begin{bmatrix}-6.3 & -6.35 & -3.63\end{bmatrix}$
$\begin{bmatrix}-3.16 & -3.8 & -5.98\end{bmatrix}$
$\begin{bmatrix}-0.02 & -3.02 & -5.98\end{bmatrix}$
$\begin{bmatrix}-0.8 & -4.39 & -4.41\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?

e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

438. Ray R has starting point e=$\begin{bmatrix}-9.33 & -9.83 & 1.83\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.32 & 0.81 & -0.49\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}4.85 & -5.21 & 0.05\end{bmatrix}$
$\begin{bmatrix}0.1 & -1.42 & 1.63\end{bmatrix}$
$\begin{bmatrix}-0.85 & -3.0 & 1.95\end{bmatrix}$
$\begin{bmatrix}6.74 & -1.42 & -0.58\end{bmatrix}$
$\begin{bmatrix}2.0 & -8.69 & 1.0\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

439. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 2) in a 703 x 386 image with the following parameters? l=1, r=2, b=3, t=4 view type = perspective
camera origin = $\begin{bmatrix}2.0 & 4.0 & -5.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.45 & -0.89 & 0.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.78 & 0.2 & -0.59\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.17 & 0.7 & -0.7\end{bmatrix}$
image plane at distance 1 in front of viewpoint

440. Ray R has starting point e=$\begin{bmatrix}-6.28 & 5.94 & 0.82\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.41 & -0.82 & 0.41\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}0.49 & 4.95 & 2.11\end{bmatrix}$
$\begin{bmatrix}-0.16 & 1.7 & -1.14\end{bmatrix}$
$\begin{bmatrix}0.65 & 5.76 & 2.92\end{bmatrix}$
$\begin{bmatrix}0.49 & 1.54 & -0.16\end{bmatrix}$
$\begin{bmatrix}-0.16 & 5.6 & 1.46\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

441. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 4) in a 465 x 421 image with the following parameters? l=-4, r=-3, b=-2, t=-1 view type = orthographic
camera origin = $\begin{bmatrix}2.0 & 4.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.3 & -0.3 & -0.9\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.82 & -0.41 & 0.41\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.8 & 0.0 & 0.6\end{bmatrix}$

442. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 4) in a 746 x 316 image with the following parameters? l=2, r=4, b=-4, t=3 view type = perspective
camera origin = $\begin{bmatrix}4.0 & 2.0 & -3.0\end{bmatrix}$

camera u axis = $\begin{bmatrix}0.0 & 0.71 & 0.71\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.46 & -0.46 & -0.76\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.56 & -0.37 & 0.74\end{bmatrix}$
image plane at distance 1 in front of viewpoint

443. Ray R has starting point e=$\begin{bmatrix}-1.83 & 3.5 & -0.85\end{bmatrix}$
and direction d=$\begin{bmatrix}0.71 & -0.71 & -0.0\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-0.61 & 3.55 & -1.6\end{bmatrix}$
$\begin{bmatrix}-1.36 & 2.06 & -0.11\end{bmatrix}$
$\begin{bmatrix}-3.0 & 1.76 & 0.79\end{bmatrix}$
$\begin{bmatrix}-1.36 & 6.53 & -3.68\end{bmatrix}$
$\begin{bmatrix}-7.02 & 5.64 & -0.7\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

444. Ray R has starting point e=$\begin{bmatrix}-4.36 & 8.3 & 2.72\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.17 & -0.51 & 0.85\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-1.04 & 2.04 & 7.93\end{bmatrix}$
$\begin{bmatrix}-4.75 & 8.58 & 6.18\end{bmatrix}$
$\begin{bmatrix}-4.75 & 6.62 & 2.25\end{bmatrix}$
$\begin{bmatrix}-2.56 & 4.22 & 6.18\end{bmatrix}$
$\begin{bmatrix}-5.18 & 7.27 & 1.82\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

445. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 1) in a 521 x 251 image with the following parameters? l=-5, r=0, b=-4, t=2 view type = orthographic
camera origin = $\begin{bmatrix}-3.0 & -2.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.67 & -0.33 & -0.67\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.93 & 0.37 & 0.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.91 & -0.18 & -0.37\end{bmatrix}$

446. Ray R has starting point e=$\begin{bmatrix}-4.12 & -1.67 & -3.98\end{bmatrix}$
and direction d=$\begin{bmatrix}0.81 & -0.49 & -0.32\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-3.78 & -1.08 & -5.7\end{bmatrix}$
$\begin{bmatrix}1.68 & -6.12 & -7.8\end{bmatrix}$
$\begin{bmatrix}-2.38 & -2.76 & -4.3\end{bmatrix}$
$\begin{bmatrix}-1.12 & -4.58 & -1.5\end{bmatrix}$
$\begin{bmatrix}-2.8 & -2.2 & -5.0\end{bmatrix}$
.

b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

447. Ray R has starting point e=$\begin{bmatrix}-13.45 & 1.24 & 2.37\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.33 & -0.67 & -0.67\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-8.0 & 1.0 & 2.0\end{bmatrix}$ $\begin{bmatrix}-2.0 & -2.0 & 2.0\end{bmatrix}$ $\begin{bmatrix}-5.0 & 2.0 & 2.0\end{bmatrix}$ $\begin{bmatrix}-8.0 & -1.0 & 2.0\end{bmatrix}$ $\begin{bmatrix}-4.0 & -3.0 & 2.0\end{bmatrix}$.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

448. Ray R has starting point e=$\begin{bmatrix}4.15 & 0.7 & -0.07\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.49 & -0.32 & 0.81\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}1.15 & -1.85 & 1.15\end{bmatrix}$ $\begin{bmatrix}3.01 & 1.24 & 4.55\end{bmatrix}$ $\begin{bmatrix}3.16 & -4.16 & -2.24\end{bmatrix}$ $\begin{bmatrix}0.38 & -3.23 & -0.39\end{bmatrix}$ $\begin{bmatrix}-1.31 & -3.7 & -0.54\end{bmatrix}$.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

449. Ray R has starting point e=$\begin{bmatrix}-10.56 & 2.31 & 2.76\end{bmatrix}$ and direction d=$\begin{bmatrix}0.87 & 0.22 & -0.44\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-5.51 & -2.35 & -7.12\end{bmatrix}$ $\begin{bmatrix}-2.91 & 2.68 & -2.54\end{bmatrix}$ $\begin{bmatrix}-0.63 & 4.2 & -0.26\end{bmatrix}$ $\begin{bmatrix}-4.9 & 2.37 & -3.91\end{bmatrix}$ $\begin{bmatrix}-3.37 & -2.96 & -6.2\end{bmatrix}$.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

450. Ray R has starting point e=$\begin{bmatrix}3.43 & 3.29 & 1.9\end{bmatrix}$

and direction d=$\begin{bmatrix}-0.59 & 0.78 & -0.2\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}2.6 & 3.71 & 1.97\end{bmatrix}$
$\begin{bmatrix}3.46 & 2.86 & 2.49\end{bmatrix}$
$\begin{bmatrix}2.77 & 5.43 & 0.94\end{bmatrix}$
$\begin{bmatrix}1.06 & -1.43 & 5.06\end{bmatrix}$
$\begin{bmatrix}3.12 & 1.14 & 3.51\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

451. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 2) in a 549 x 380 image with the following parameters? l=-4, r=-2, b=0, t=1 view type = perspective camera origin = $\begin{bmatrix}-5.0 & 0.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.24 & 0.94 & -0.24\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.24 & 0.24 & -0.94\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.73 & -0.49 & -0.49\end{bmatrix}$
image plane at distance 0 in front of viewpoint

452. Ray R has starting point e=$\begin{bmatrix}-4.37 & 1.94 & 0.63\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.14 & 0.7 & 0.7\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-2.19 & 1.14 & -1.7\end{bmatrix}$
$\begin{bmatrix}-4.23 & 4.49 & -5.23\end{bmatrix}$
$\begin{bmatrix}-2.0 & 3.0 & -3.0\end{bmatrix}$
$\begin{bmatrix}-4.23 & 5.97 & -6.34\end{bmatrix}$
$\begin{bmatrix}-0.33 & 1.89 & -1.33\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

453. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 0) in a 536 x 542 image with the following parameters? l=-2, r=0, b=-5, t=-4 view type = perspective camera origin = $\begin{bmatrix}2.0 & 4.0 & 0.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.64 & -0.43 & -0.64\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.17 & -0.7 & 0.7\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.18 & -0.91 & 0.37\end{bmatrix}$
image plane at distance 2 in front of viewpoint

454. Ray R has starting point e=$\begin{bmatrix}-13.4 & -4.11 & -0.86\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.0 & 0.89 & 0.45\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-2.95 & 4.54 & -4.95\end{bmatrix}$
$\begin{bmatrix}-2.46 & -3.08 & -0.57\end{bmatrix}$
$\begin{bmatrix}-3.92 & 1.95 & -3.0\end{bmatrix}$
$\begin{bmatrix}-2.78 & 0.65 & -2.68\end{bmatrix}$

$\begin{bmatrix}0.14 & 0.32 & -3.65\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

455. Ray R has starting point e=$\begin{bmatrix}-2.57 & -1.72 & -0.12\end{bmatrix}$
and direction d=$\begin{bmatrix}0.2 & 0.78 & -0.59\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-5.75 & -4.71 & -1.86\end{bmatrix}$
$\begin{bmatrix}-3.2 & 0.39 & -6.96\end{bmatrix}$
$\begin{bmatrix}-1.23 & 0.59 & 0.3\end{bmatrix}$
$\begin{bmatrix}-6.53 & -4.12 & -6.77\end{bmatrix}$
$\begin{bmatrix}-5.16 & -3.53 & -3.04\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

456. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 2) in a 284 x 517 image with the following parameters? l=0, r=1, b=-3, t=-2 view type = orthographic
camera origin = $\begin{bmatrix}0.0 & 3.0 & 2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.62 & -0.77 & -0.15\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & -1.0 & 0.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.0 & 0.45 & -0.89\end{bmatrix}$

457. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 4) in a 717 x 524 image with the following parameters? l=-4, r=-2, b=-2, t=3 view type = perspective
camera origin = $\begin{bmatrix}2.0 & -4.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.46 & -0.76 & 0.46\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.49 & -0.62 & -0.62\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.37 & -0.18 & -0.91\end{bmatrix}$
image plane at distance 4 in front of viewpoint

458. Ray R has starting point e=$\begin{bmatrix}-3.18 & 0.56 & -3.41\end{bmatrix}$
and direction d=$\begin{bmatrix}0.96 & -0.19 & -0.19\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}3.97 & -1.99 & -6.97\end{bmatrix}$
$\begin{bmatrix}0.01 & 0.84 & -4.14\end{bmatrix}$
$\begin{bmatrix}-0.84 & 0.56 & -2.87\end{bmatrix}$
$\begin{bmatrix}0.01 & 0.84 & -4.14\end{bmatrix}$
$\begin{bmatrix}2.13 & 0.7 & -6.69\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?

e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

459. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 4) in a 515 x 667 image with the following parameters? l=-2, r=-1, b=-1, t=4 view type = orthographic
camera origin = $\begin{bmatrix}2.0 & -2.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.71 & -0.71 & 0.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.8 & 0.0 & 0.6\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.24 & -0.94 & -0.24\end{bmatrix}$

460. Ray R has starting point e=$\begin{bmatrix}1.51 & -0.33 & 4.17\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.35 & 0.87 & 0.35\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}1.11 & 0.0 & 0.77\end{bmatrix}$
$\begin{bmatrix}0.19 & 3.34 & 7.64\end{bmatrix}$
$\begin{bmatrix}3.16 & 2.6 & 0.59\end{bmatrix}$
$\begin{bmatrix}0.37 & 2.23 & 5.6\end{bmatrix}$
$\begin{bmatrix}0.0 & -0.74 & 1.89\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

461. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 0) in a 566 x 340 image with the following parameters? l=-4, r=-1, b=-1, t=3 view type = perspective
camera origin = $\begin{bmatrix}-2.0 & -2.0 & 0.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.51 & 0.17 & -0.85\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & -0.2 & -0.98\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.67 & 0.33 & -0.67\end{bmatrix}$
image plane at distance 2 in front of viewpoint

462. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 0) in a 634 x 636 image with the following parameters? l=-5, r=4, b=-5, t=0 view type = orthographic
camera origin = $\begin{bmatrix}-3.0 & 0.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.89 & 0.45 & 0.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.64 & 0.43 & 0.64\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.43 & -0.64 & 0.64\end{bmatrix}$

463. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 2) in a 692 x 321 image with the following parameters? l=-5, r=-3, b=-2, t=1 view type = perspective
camera origin = $\begin{bmatrix}-2.0 & 1.0 & 4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.74 & -0.37 & -0.56\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.24 & -0.24 & 0.94\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.3 & -0.75 & -0.6\end{bmatrix}$
image plane at distance 3 in front of viewpoint

464. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 3) in a 480 x 362 image with the following parameters? l=-2, r=4, b=2, t=3 view type = perspective camera origin = $\begin{bmatrix}-5.0 & -4.0 & -5.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.78 & -0.59 & -0.2\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.62 & 0.0 & -0.78\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.69 & 0.51 & 0.51\end{bmatrix}$
image plane at distance 3 in front of viewpoint

465. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 3) in a 400 x 319 image with the following parameters? l=-3, r=-2, b=-1, t=1 view type = orthographic camera origin = $\begin{bmatrix}-2.0 & -5.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.78 & -0.2 & -0.59\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.58 & 0.58 & 0.58\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.32 & 0.95 & 0.0\end{bmatrix}$

466. Ray R has starting point e=$\begin{bmatrix}-11.04 & 4.31 & 1.23\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.59 & 0.78 & -0.2\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-6.95 & 5.76 & 1.04\end{bmatrix}$
$\begin{bmatrix}-6.95 & 3.31 & -5.08\end{bmatrix}$
$\begin{bmatrix}-2.86 & 0.86 & -1.0\end{bmatrix}$
$\begin{bmatrix}-3.95 & 2.5 & 0.36\end{bmatrix}$
$\begin{bmatrix}-5.31 & 2.22 & -3.72\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

467. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 0) in a 317 x 744 image with the following parameters? l=-5, r=-1, b=1, t=2 view type = orthographic camera origin = $\begin{bmatrix}-2.0 & -2.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.51 & -0.85 & 0.17\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.3 & 0.3 & 0.9\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.8 & -0.27 & -0.53\end{bmatrix}$

468. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 2) in a 536 x 573 image with the following parameters? l=-2, r=-1, b=0, t=1 view type = orthographic camera origin = $\begin{bmatrix}-3.0 & 3.0 & 0.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.65 & -0.39 & -0.65\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.64 & -0.64 & 0.43\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.68 & -0.68 & -0.27\end{bmatrix}$

469. Ray R has starting point e=$\begin{bmatrix}-3.05 & 2.86 & 2.07\end{bmatrix}$
and direction d=$\begin{bmatrix}0.7 & -0.7 & 0.17\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-1.5 & -2.22 & 4.12\end{bmatrix}$
$\begin{bmatrix}-0.87 & 2.94 & 3.34\end{bmatrix}$

$\begin{bmatrix}3.5 & 8.4 & -2.12\end{bmatrix}$
$\begin{bmatrix}-0.25 & 4.34 & 2.56\end{bmatrix}$
$\begin{bmatrix}-0.87 & 0.28 & 3.34\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

470. Ray R has starting point e=$\begin{bmatrix}-0.03 & -2.95 & 0.61\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.2 & 0.59 & 0.78\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-1.85 & -2.9 & 1.05\end{bmatrix}$
$\begin{bmatrix}2.9 & -5.11 & 2.63\end{bmatrix}$
$\begin{bmatrix}-1.85 & -0.37 & 1.05\end{bmatrix}$
$\begin{bmatrix}1.95 & -4.16 & 2.32\end{bmatrix}$
$\begin{bmatrix}2.9 & 0.9 & 2.63\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

471. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 1) in a 704 x 298 image with the following parameters? l=-5, r=4, b=-4, t=-2 view type = perspective
camera origin = $\begin{bmatrix}-2.0 & 1.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}nan & nan & nan\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.67 & -0.67 & 0.33\end{bmatrix}$
camera w axis = $\begin{bmatrix}-1.0 & 0.0 & 0.0\end{bmatrix}$
image plane at distance 1 in front of viewpoint

472. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 3) in a 456 x 267 image with the following parameters? l=-4, r=0, b=-1, t=0 view type = perspective
camera origin = $\begin{bmatrix}4.0 & -2.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.56 & 0.74 & -0.37\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.58 & -0.58 & -0.58\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.53 & 0.8 & -0.27\end{bmatrix}$
image plane at distance 4 in front of viewpoint

473. Ray R has starting point e=$\begin{bmatrix}-3.16 & -0.03 & 0.93\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.74 & -0.56 & 0.37\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}2.96 & -5.67 & -6.4\end{bmatrix}$
$\begin{bmatrix}-2.49 & -3.49 & -3.13\end{bmatrix}$
$\begin{bmatrix}0.78 & 3.06 & -3.13\end{bmatrix}$
$\begin{bmatrix}-0.31 & -2.62 & -4.0\end{bmatrix}$
$\begin{bmatrix}3.84 & 1.31 & -5.09\end{bmatrix}$
.
b) What is the normal to P?

c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

474. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 2) in a 586 x 446 image with the following parameters? l=-5, r=1, b=1, t=2 view type = perspective camera origin = $\begin{bmatrix}-2.0 & -1.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.37 & -0.74 & 0.56\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.64 & 0.64 & -0.43\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.17 & 0.51 & -0.85\end{bmatrix}$
image plane at distance 4 in front of viewpoint

475. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 3) in a 487 x 375 image with the following parameters? l=-4, r=1, b=-5, t=-3 view type = perspective camera origin = $\begin{bmatrix}0.0 & -5.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.71 & 0.0 & 0.71\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.58 & -0.58 & -0.58\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.69 & -0.51 & -0.51\end{bmatrix}$
image plane at distance 2 in front of viewpoint

476. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 4) in a 504 x 264 image with the following parameters? l=-4, r=-2, b=-4, t=1 view type = perspective camera origin = $\begin{bmatrix}2.0 & 0.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.51 & 0.51 & 0.69\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & 0.0 & 1.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.62 & -0.62 & -0.49\end{bmatrix}$
image plane at distance 1 in front of viewpoint

477. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 3) in a 564 x 632 image with the following parameters? l=-3, r=4, b=-1, t=3 view type = orthographic camera origin = $\begin{bmatrix}-4.0 & 0.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.46 & -0.76 & 0.46\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.71 & 0.42 & 0.57\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.51 & 0.51 & -0.69\end{bmatrix}$

478. Ray R has starting point e=$\begin{bmatrix}5.42 & 1.62 & 6.09\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.58 & -0.58 & -0.58\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}1.38 & 1.53 & 8.36\end{bmatrix}$
$\begin{bmatrix}6.62 & 1.31 & 5.31\end{bmatrix}$
$\begin{bmatrix}9.67 & -0.65 & -0.15\end{bmatrix}$
$\begin{bmatrix}5.31 & -0.22 & 2.91\end{bmatrix}$
$\begin{bmatrix}0.94 & 0.0 & 5.53\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

479. Ray R has starting point e=$\begin{bmatrix}-5.79 & -5.16 & -0.36\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.69 & -0.23 & 0.69\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}9.4 & -6.62 & 8.63\end{bmatrix}$
$\begin{bmatrix}6.93 & -4.15 & 4.93\end{bmatrix}$
$\begin{bmatrix}9.4 & -5.39 & 7.09\end{bmatrix}$
$\begin{bmatrix}6.47 & -5.23 & 6.16\end{bmatrix}$
$\begin{bmatrix}1.38 & -5.39 & 5.08\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

480. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 0) in a 373 x 590 image with the following parameters? l=-3, r=0, b=2, t=3 view type = perspective
camera origin = $\begin{bmatrix}0.0 & 2.0 & 0.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.67 & 0.67 & 0.33\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.51 & -0.51 & -0.69\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.41 & -0.82 & -0.41\end{bmatrix}$
image plane at distance 2 in front of viewpoint

481. Ray R has starting point e=$\begin{bmatrix}-7.16 & -4.24 & 1.4\end{bmatrix}$
and direction d=$\begin{bmatrix}0.43 & -0.64 & -0.64\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-2.68 & -4.3 & -4.95\end{bmatrix}$
$\begin{bmatrix}-0.24 & -6.24 & -6.57\end{bmatrix}$
$\begin{bmatrix}0.41 & -3.97 & -2.35\end{bmatrix}$
$\begin{bmatrix}0.89 & -2.03 & 1.22\end{bmatrix}$
$\begin{bmatrix}-0.73 & -4.3 & -3.65\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

482. Ray R has starting point e=$\begin{bmatrix}-7.54 & -0.77 & -0.16\end{bmatrix}$
and direction d=$\begin{bmatrix}0.78 & -0.0 & 0.62\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-3.75 & -0.2 & -4.62\end{bmatrix}$
$\begin{bmatrix}-1.78 & -6.75 & 0.62\end{bmatrix}$
$\begin{bmatrix}-2.44 & -5.65 & 1.06\end{bmatrix}$
$\begin{bmatrix}-1.35 & -5.87 & -2.87\end{bmatrix}$
$\begin{bmatrix}-4.4 & -0.2 & -2.0\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

483. Ray R has starting point e=$\begin{bmatrix}-11.31 & -1.01 & 0.26\end{bmatrix}$ and direction d=$\begin{bmatrix}0.2 & -0.59 & 0.78\end{bmatrix}$ . Polygon P has vertices $\begin{bmatrix}-0.44 & -0.85 & -2.56\end{bmatrix}$ $\begin{bmatrix}0.2 & -2.77 & -0.64\end{bmatrix}$ $\begin{bmatrix}-1.93 & -2.35 & 1.92\end{bmatrix}$ $\begin{bmatrix}-2.57 & -1.28 & 1.28\end{bmatrix}$ $\begin{bmatrix}-2.15 & -1.71 & 1.28\end{bmatrix}$ .
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

484. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 0) in a 692 x 527 image with the following parameters? l=2, r=4, b=-5, t=-4 view type = orthographic camera origin = $\begin{bmatrix}3.0 & -2.0 & 4.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.53 & -0.53 & -0.66\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.39 & -0.65 & -0.65\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.14 & -0.7 & -0.7\end{bmatrix}$

485. Ray R has starting point e=$\begin{bmatrix}-16.77 & 3.65 & -2.52\end{bmatrix}$ and direction d=$\begin{bmatrix}0.7 & 0.17 & 0.7\end{bmatrix}$ . Polygon P has vertices $\begin{bmatrix}-4.0 & 2.06 & 1.0\end{bmatrix}$ $\begin{bmatrix}-5.25 & 0.19 & -0.56\end{bmatrix}$ $\begin{bmatrix}-1.5 & 5.5 & 4.12\end{bmatrix}$ $\begin{bmatrix}-4.0 & 1.44 & 1.0\end{bmatrix}$ $\begin{bmatrix}-2.75 & 1.91 & 2.56\end{bmatrix}$ .
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

486. Ray R has starting point e=$\begin{bmatrix}4.14 & -2.29 & -2.87\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.32 & 0.81 & 0.49\end{bmatrix}$ . Polygon P has vertices $\begin{bmatrix}1.66 & -3.68 & -4.45\end{bmatrix}$ $\begin{bmatrix}4.79 & 2.58 & -3.11\end{bmatrix}$ $\begin{bmatrix}3.45 & -0.11 & 0.47\end{bmatrix}$ $\begin{bmatrix}5.24 & 3.47 & 0.92\end{bmatrix}$ $\begin{bmatrix}5.24 & 3.47 & -7.13\end{bmatrix}$ .
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

487. Ray R has starting point e=$\begin{bmatrix}-6.12 & -4.56 & 0.7\end{bmatrix}$ and direction d=$\begin{bmatrix}0.7 & 0.7 & 0.17\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-0.44 & -1.71 & 1.15\end{bmatrix}$ $\begin{bmatrix}6.44 & -5.84 & -0.69\end{bmatrix}$ $\begin{bmatrix}3.69 & -6.52 & -2.29\end{bmatrix}$ $\begin{bmatrix}4.38 & -3.54 & 0.92\end{bmatrix}$ $\begin{bmatrix}0.94 & -1.25 & 2.06\end{bmatrix}$.

b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

488. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 3) in a 561 x 434 image with the following parameters? l=-5, r=0, b=-3, t=-2 view type = orthographic camera origin = $\begin{bmatrix}4.0 & 3.0 & -1.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.45 & 0.89 & 0.0\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.2 & 0.59 & -0.78\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.51 & -0.85 & 0.17\end{bmatrix}$

489. Ray R has starting point e=$\begin{bmatrix}-4.59 & -1.67 & 1.0\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.0 & -1.0 & -0.0\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}0.21 & -4.89 & 4.71\end{bmatrix}$ $\begin{bmatrix}5.58 & -2.21 & -6.47\end{bmatrix}$ $\begin{bmatrix}5.58 & -2.21 & -5.13\end{bmatrix}$ $\begin{bmatrix}2.89 & -3.55 & -1.55\end{bmatrix}$ $\begin{bmatrix}-1.58 & -5.79 & -6.47\end{bmatrix}$.

b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

490. Ray R has starting point e=$\begin{bmatrix}-2.33 & -3.19 & -1.78\end{bmatrix}$ and direction d=$\begin{bmatrix}-1.0 & -0.0 & -0.0\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-4.33 & -4.22 & 0.22\end{bmatrix}$ $\begin{bmatrix}-3.5 & -3.66 & -2.55\end{bmatrix}$ $\begin{bmatrix}-1.0 & -2.0 & -3.11\end{bmatrix}$ $\begin{bmatrix}-1.0 & -2.0 & -8.38\end{bmatrix}$ $\begin{bmatrix}-2.66 & -3.11 & -6.16\end{bmatrix}$.

b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

491. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 2) in a 738 x 255 image with the following parameters? l=-3, r=2, b=4, t=5 view type = orthographic
camera origin = $\begin{bmatrix}2.0 & 1.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.19 & -0.19 & -0.96\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.44 & 0.22 & 0.87\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.0 & -0.89 & 0.45\end{bmatrix}$

492. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 4) in a 391 x 417 image with the following parameters? l=-4, r=3, b=-1, t=1 view type = orthographic
camera origin = $\begin{bmatrix}0.0 & -1.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.71 & 0.0 & -0.71\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.74 & 0.56 & 0.37\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.49 & -0.81 & 0.32\end{bmatrix}$

493. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 3) in a 304 x 260 image with the following parameters? l=2, r=3, b=-1, t=3 view type = perspective
camera origin = $\begin{bmatrix}-2.0 & 0.0 & 0.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.53 & -0.27 & -0.8\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.59 & 0.2 & 0.78\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.51 & -0.86 & 0.0\end{bmatrix}$
image plane at distance 2 in front of viewpoint

494. Ray R has starting point e=$\begin{bmatrix}-13.75 & -1.63 & 1.86\end{bmatrix}$
and direction d=$\begin{bmatrix}0.7 & 0.7 & -0.14\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-4.59 & -0.73 & -4.94\end{bmatrix}$
$\begin{bmatrix}-5.96 & 5.75 & -0.43\end{bmatrix}$
$\begin{bmatrix}-4.78 & 2.22 & -2.78\end{bmatrix}$
$\begin{bmatrix}-6.55 & 2.8 & -2.78\end{bmatrix}$
$\begin{bmatrix}0.31 & 1.04 & -2.39\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

495. Ray R has starting point e=$\begin{bmatrix}0.1 & 0.94 & 3.0\end{bmatrix}$
and direction d=$\begin{bmatrix}0.2 & -0.0 & 0.98\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-1.94 & -0.27 & 8.28\end{bmatrix}$
$\begin{bmatrix}3.14 & 2.14 & 1.86\end{bmatrix}$
$\begin{bmatrix}2.07 & 3.21 & 4.0\end{bmatrix}$
$\begin{bmatrix}2.07 & 3.74 & 4.27\end{bmatrix}$
$\begin{bmatrix}-0.87 & -0.8 & 6.41\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?

e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

496. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 4) in a 417 x 426 image with the following parameters? l=-5, r=0, b=-4, t=-2 view type = orthographic
camera origin = $\begin{bmatrix}2.0 & -1.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.0 & 0.6 & 0.8\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.46 & -0.76 & -0.46\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.57 & 0.42 & -0.71\end{bmatrix}$

497. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 0) in a 426 x 503 image with the following parameters? l=-4, r=-1, b=-4, t=-2 view type = orthographic
camera origin = $\begin{bmatrix}-5.0 & -3.0 & -5.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.27 & -0.53 & -0.8\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.37 & -0.74 & -0.56\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.73 & 0.49 & 0.49\end{bmatrix}$

498. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 0) in a 397 x 667 image with the following parameters? l=-1, r=2, b=-5, t=-4 view type = orthographic
camera origin = $\begin{bmatrix}-4.0 & 0.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.59 & 0.2 & 0.78\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.58 & 0.58 & 0.58\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.56 & -0.37 & 0.74\end{bmatrix}$

499. Ray R has starting point e=$\begin{bmatrix}-1.02 & 1.07 & -3.63\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.2 & -0.0 & 0.98\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}3.6 & 2.0 & -0.81\end{bmatrix}$
$\begin{bmatrix}1.36 & 3.49 & -1.55\end{bmatrix}$
$\begin{bmatrix}-1.62 & 4.09 & -6.02\end{bmatrix}$
$\begin{bmatrix}6.58 & 0.51 & 1.43\end{bmatrix}$
$\begin{bmatrix}5.09 & 0.21 & -2.3\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

500. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 2) in a 305 x 680 image with the following parameters? l=-5, r=-3, b=0, t=1 view type = perspective
camera origin = $\begin{bmatrix}-5.0 & -5.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.22 & 0.87 & 0.44\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.67 & -0.33 & 0.67\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.0 & -0.71 & -0.71\end{bmatrix}$
image plane at distance 2 in front of viewpoint

501. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 4) in a 602 x 416 image with the following parameters? l=-2, r=2, b=-4, t=-1 view type = perspective
camera origin = $\begin{bmatrix}0.0 & 1.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.81 & 0.32 & -0.49\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.8 & 0.53 & -0.27\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.57 & -0.71 & 0.42\end{bmatrix}$
image plane at distance 4 in front of viewpoint

502. Ray R has starting point e=$\begin{bmatrix}-9.01 & 0.89 & 1.85\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.0 & -0.95 & -0.32\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-2.18 & -2.82 & -2.55\end{bmatrix}$
$\begin{bmatrix}-6.27 & -2.0 & -8.27\end{bmatrix}$
$\begin{bmatrix}-1.37 & -1.59 & -4.18\end{bmatrix}$
$\begin{bmatrix}-6.27 & -4.45 & -3.37\end{bmatrix}$
$\begin{bmatrix}-5.04 & -5.27 & -0.51\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

503. Ray R has starting point e=$\begin{bmatrix}-8.02 & -12.39 & 3.45\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.46 & 0.76 & -0.46\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}0.0 & -4.0 & -3.0\end{bmatrix}$
$\begin{bmatrix}2.0 & -6.0 & -3.0\end{bmatrix}$
$\begin{bmatrix}4.0 & -10.0 & -3.0\end{bmatrix}$
$\begin{bmatrix}-1.0 & -2.0 & -3.0\end{bmatrix}$
$\begin{bmatrix}4.0 & -2.0 & -3.0\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

504. Ray R has starting point e=$\begin{bmatrix}-3.63 & 2.7 & 5.63\end{bmatrix}$
and direction d=$\begin{bmatrix}0.3 & -0.3 & 0.9\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-3.25 & 1.87 & 8.24\end{bmatrix}$
$\begin{bmatrix}-5.22 & 0.56 & 3.0\end{bmatrix}$
$\begin{bmatrix}-3.04 & 4.71 & 3.44\end{bmatrix}$
$\begin{bmatrix}-3.25 & 2.96 & 6.06\end{bmatrix}$
$\begin{bmatrix}-2.6 & 5.15 & 4.31\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

505. Ray R has starting point e=$\begin{bmatrix}-12.62 & -3.42 & 1.3\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.56 & -0.74 & -0.37\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-3.0 & -5.79 & -5.0\end{bmatrix}$
$\begin{bmatrix}-3.89 & -4.89 & -6.79\end{bmatrix}$
$\begin{bmatrix}-1.66 & -9.37 & -2.32\end{bmatrix}$
$\begin{bmatrix}-1.21 & -7.13 & -1.42\end{bmatrix}$
$\begin{bmatrix}-3.0 & -4.0 & -5.0\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

506. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 1) in a 281 x 475 image with the following parameters? l=1, r=2, b=3, t=4 view type = perspective
camera origin = $\begin{bmatrix}0.0 & 4.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.94 & -0.24 & 0.24\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.58 & -0.58 & 0.58\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.35 & -0.87 & 0.35\end{bmatrix}$
image plane at distance 2 in front of viewpoint

507. Ray R has starting point e=$\begin{bmatrix}-6.22 & -2.92 & -1.06\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.32 & -0.0 & -0.95\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-6.01 & -2.99 & -1.03\end{bmatrix}$
$\begin{bmatrix}-5.51 & 1.07 & -1.54\end{bmatrix}$
$\begin{bmatrix}-7.7 & -6.87 & -2.55\end{bmatrix}$
$\begin{bmatrix}-4.83 & 0.9 & -0.35\end{bmatrix}$
$\begin{bmatrix}-7.37 & -1.13 & -3.9\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

508. Ray R has starting point e=$\begin{bmatrix}-3.22 & 6.18 & -5.17\end{bmatrix}$
and direction d=$\begin{bmatrix}0.71 & -0.71 & -0.0\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}0.15 & 0.15 & -2.08\end{bmatrix}$
$\begin{bmatrix}0.54 & 0.34 & 0.04\end{bmatrix}$
$\begin{bmatrix}-2.73 & 7.85 & -8.81\end{bmatrix}$
$\begin{bmatrix}-2.54 & 9.58 & -6.12\end{bmatrix}$
$\begin{bmatrix}-1.0 & 7.85 & -0.15\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

509. Ray R has starting point e=$\begin{bmatrix}-5.93 & 6.29 & 1.26\end{bmatrix}$
and direction d=$\begin{bmatrix}0.23 & -0.69 & -0.69\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-2.15 & 4.23 & -5.71\end{bmatrix}$
$\begin{bmatrix}-3.08 & 2.23 & -2.31\end{bmatrix}$
$\begin{bmatrix}-1.54 & 4.23 & -2.62\end{bmatrix}$
$\begin{bmatrix}-2.77 & 2.07 & -0.15\end{bmatrix}$
$\begin{bmatrix}0.16 & 6.09 & -1.54\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

510. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 1) in a 632 x 256 image with the following parameters? l=-4, r=2, b=-5, t=-4 view type = perspective
camera origin = $\begin{bmatrix}-4.0 & 0.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.89 & 0.45 & 0.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.44 & 0.87 & -0.22\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.58 & -0.58 & 0.58\end{bmatrix}$
image plane at distance 1 in front of viewpoint

511. Ray R has starting point e=$\begin{bmatrix}-11.16 & 4.14 & 1.07\end{bmatrix}$
and direction d=$\begin{bmatrix}0.71 & -0.0 & -0.71\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-7.33 & 2.33 & 2.0\end{bmatrix}$
$\begin{bmatrix}-2.67 & 2.67 & 4.0\end{bmatrix}$
$\begin{bmatrix}-4.0 & 3.33 & 2.67\end{bmatrix}$
$\begin{bmatrix}-0.67 & 2.33 & 5.33\end{bmatrix}$
$\begin{bmatrix}-6.0 & 5.0 & 0.0\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

512. Ray R has starting point e=$\begin{bmatrix}-10.13 & -1.64 & -0.54\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.2 & -0.59 & 0.78\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-4.49 & 3.73 & -0.27\end{bmatrix}$
$\begin{bmatrix}-2.7 & -2.83 & -8.92\end{bmatrix}$
$\begin{bmatrix}-5.39 & 2.83 & -4.3\end{bmatrix}$
$\begin{bmatrix}-3.6 & 3.13 & 0.77\end{bmatrix}$
$\begin{bmatrix}-4.79 & 2.39 & -3.7\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

513. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 4) in a 552 x 701 image with the following parameters? l=-1, r=0, b=0, t=3 view type = orthographic
camera origin = $\begin{bmatrix}3.0 & -3.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.7 & -0.17 & 0.7\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.59 & -0.2 & -0.78\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.95 & 0.0 & 0.32\end{bmatrix}$

514. Ray R has starting point e=$\begin{bmatrix}-3.45 & 0.68 & -1.95\end{bmatrix}$
and direction d=$\begin{bmatrix}0.62 & 0.49 & 0.62\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}0.06 & 0.91 & -0.31\end{bmatrix}$
$\begin{bmatrix}-1.25 & 4.62 & 1.87\end{bmatrix}$
$\begin{bmatrix}0.49 & 0.69 & -0.53\end{bmatrix}$
$\begin{bmatrix}-0.38 & -2.8 & -2.06\end{bmatrix}$
$\begin{bmatrix}-1.25 & 0.69 & -0.09\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

515. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 1) in a 737 x 388 image with the following parameters? l=-4, r=3, b=-4, t=-3 view type = perspective
camera origin = $\begin{bmatrix}-4.0 & 3.0 & -5.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.58 & -0.58 & -0.58\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.22 & 0.44 & -0.87\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.51 & -0.85 & -0.17\end{bmatrix}$
image plane at distance 4 in front of viewpoint

516. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 4) in a 286 x 274 image with the following parameters? l=2, r=4, b=2, t=4 view type = orthographic
camera origin = $\begin{bmatrix}-1.0 & 4.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.65 & -0.65 & 0.39\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.56 & -0.37 & -0.74\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.0 & 0.2 & -0.98\end{bmatrix}$

517. Ray R has starting point e=$\begin{bmatrix}-1.49 & 3.52 & -1.85\end{bmatrix}$
and direction d=$\begin{bmatrix}0.24 & -0.24 & -0.94\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}2.44 & 4.31 & -2.6\end{bmatrix}$
$\begin{bmatrix}-0.62 & 2.35 & -5.0\end{bmatrix}$
$\begin{bmatrix}-3.24 & 3.0 & -2.38\end{bmatrix}$
$\begin{bmatrix}5.93 & 1.25 & -10.46\end{bmatrix}$
$\begin{bmatrix}-1.49 & 3.0 & -3.25\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?

e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

518. Ray R has starting point e=$\begin{bmatrix}-0.39 & -2.79 & -0.35\end{bmatrix}$ and direction d=$\begin{bmatrix}0.58 & 0.58 & 0.58\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-1.97 & -1.24 & -1.7\end{bmatrix}$
$\begin{bmatrix}-1.97 & -1.73 & -2.18\end{bmatrix}$
$\begin{bmatrix}0.94 & -2.94 & 0.97\end{bmatrix}$
$\begin{bmatrix}-1.97 & 0.46 & 0.0\end{bmatrix}$
$\begin{bmatrix}-2.46 & -0.51 & -1.7\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

519. Ray R has starting point e=$\begin{bmatrix}-7.77 & -1.9 & 0.74\end{bmatrix}$ and direction d=$\begin{bmatrix}0.51 & -0.0 & 0.86\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-4.12 & 1.54 & 5.54\end{bmatrix}$
$\begin{bmatrix}-4.83 & -3.41 & 0.59\end{bmatrix}$
$\begin{bmatrix}-3.41 & 0.12 & 4.12\end{bmatrix}$
$\begin{bmatrix}-0.59 & 1.54 & 5.54\end{bmatrix}$
$\begin{bmatrix}-4.12 & -2.0 & 2.0\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

520. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 4) in a 291 x 513 image with the following parameters? l=1, r=4, b=-5, t=0 view type = perspective
camera origin = $\begin{bmatrix}2.0 & 4.0 & 0.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.7 & 0.17 & 0.7\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.53 & 0.27 & -0.8\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.71 & 0.0 & 0.71\end{bmatrix}$
image plane at distance 0 in front of viewpoint

521. Ray R has starting point e=$\begin{bmatrix}0.87 & 2.54 & 4.33\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.82 & 0.41 & -0.41\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}1.89 & -0.51 & 1.2\end{bmatrix}$
$\begin{bmatrix}0.51 & 3.09 & 4.63\end{bmatrix}$
$\begin{bmatrix}-0.86 & 0.51 & -0.17\end{bmatrix}$
$\begin{bmatrix}2.23 & -2.06 & -0.51\end{bmatrix}$
$\begin{bmatrix}-0.34 & 2.06 & 2.4\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?

d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

522. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 0) in a 492 x 558 image with the following parameters? l=2, r=3, b=-4, t=0 view type = perspective camera origin = $\begin{bmatrix}2.0 & 1.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.23 & -0.69 & 0.69\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.82 & 0.41 & 0.41\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.6 & -0.3 & -0.75\end{bmatrix}$
image plane at distance 3 in front of viewpoint

523. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 2) in a 708 x 534 image with the following parameters? l=-1, r=0, b=-1, t=1 view type = perspective camera origin = $\begin{bmatrix}0.0 & -4.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.67 & 0.67 & -0.33\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.44 & -0.22 & 0.87\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.68 & -0.68 & 0.27\end{bmatrix}$
image plane at distance 4 in front of viewpoint

524. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 0) in a 264 x 669 image with the following parameters? l=2, r=3, b=-1, t=0 view type = orthographic camera origin = $\begin{bmatrix}3.0 & 0.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.56 & -0.37 & 0.74\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.41 & -0.82 & -0.41\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.18 & -0.37 & -0.91\end{bmatrix}$

525. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 1) in a 373 x 311 image with the following parameters? l=0, r=1, b=-4, t=-2 view type = orthographic camera origin = $\begin{bmatrix}-3.0 & 3.0 & 0.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.8 & -0.27 & 0.53\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.44 & 0.22 & -0.87\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.42 & -0.71 & 0.57\end{bmatrix}$

526. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 1) in a 313 x 633 image with the following parameters? l=0, r=4, b=-5, t=-1 view type = perspective camera origin = $\begin{bmatrix}-4.0 & 3.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.82 & -0.41 & -0.41\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.53 & -0.66 & 0.53\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.18 & 0.37 & -0.91\end{bmatrix}$
image plane at distance 4 in front of viewpoint

527. Ray R has starting point e=$\begin{bmatrix}-10.08 & 2.7 & 1.16\end{bmatrix}$
and direction d=$\begin{bmatrix}0.59 & 0.78 & -0.2\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}2.51 & 3.86 & -9.49\end{bmatrix}$
$\begin{bmatrix}-0.06 & -0.43 & -7.6\end{bmatrix}$
$\begin{bmatrix}-0.06 & -0.43 & -4.51\end{bmatrix}$
$\begin{bmatrix}1.49 & 2.14 & -8.8\end{bmatrix}$

$\begin{bmatrix}0.97 & 1.29 & -0.4\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

528. Ray R has starting point e=$\begin{bmatrix}-0.83 & 1.68 & -2.11\end{bmatrix}$ and direction d=$\begin{bmatrix}0.62 & -0.47 & -0.62\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-0.4 & 1.6 & -3.21\end{bmatrix}$
$\begin{bmatrix}-3.41 & -2.02 & 2.22\end{bmatrix}$
$\begin{bmatrix}0.81 & 4.92 & -3.51\end{bmatrix}$
$\begin{bmatrix}-0.1 & -0.21 & -5.92\end{bmatrix}$
$\begin{bmatrix}-2.51 & -2.02 & -0.49\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

529. Ray R has starting point e=$\begin{bmatrix}-2.24 & -1.73 & 0.0\end{bmatrix}$ and direction d=$\begin{bmatrix}0.51 & -0.69 & 0.51\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-3.6 & 0.72 & -3.06\end{bmatrix}$
$\begin{bmatrix}-0.56 & -2.19 & 1.71\end{bmatrix}$
$\begin{bmatrix}-3.21 & -1.53 & -0.94\end{bmatrix}$
$\begin{bmatrix}-2.41 & -5.37 & 2.77\end{bmatrix}$
$\begin{bmatrix}-1.88 & -2.19 & 0.65\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

530. Ray R has starting point e=$\begin{bmatrix}1.18 & -3.33 & 0.84\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.56 & 0.74 & 0.37\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}8.0 & -3.0 & -2.0\end{bmatrix}$
$\begin{bmatrix}8.0 & -3.0 & 0.0\end{bmatrix}$
$\begin{bmatrix}4.0 & -3.0 & 5.0\end{bmatrix}$
$\begin{bmatrix}6.0 & -3.0 & -3.0\end{bmatrix}$
$\begin{bmatrix}8.0 & -3.0 & 0.0\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

531. Ray R has starting point e=$\begin{bmatrix}-10.67 & 1.86 & 1.0\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.8 & -0.6 & -0.0\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-3.51 & -1.51 & -3.24\end{bmatrix}$ $\begin{bmatrix}-7.4 & -5.64 & -1.54\end{bmatrix}$ $\begin{bmatrix}-4.49 & -3.94 & -4.21\end{bmatrix}$ $\begin{bmatrix}-3.03 & 0.91 & -1.54\end{bmatrix}$ $\begin{bmatrix}-1.09 & 1.4 & -3.97\end{bmatrix}$.

b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

532. Ray R has starting point e=$\begin{bmatrix}-7.87 & -5.11 & 0.33\end{bmatrix}$ and direction d=$\begin{bmatrix}0.19 & 0.96 & 0.19\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}0.17 & -5.83 & -2.95\end{bmatrix}$ $\begin{bmatrix}3.0 & -3.0 & 4.12\end{bmatrix}$ $\begin{bmatrix}4.41 & -1.59 & 0.59\end{bmatrix}$ $\begin{bmatrix}5.83 & -0.17 & 0.59\end{bmatrix}$ $\begin{bmatrix}4.41 & -1.59 & -0.12\end{bmatrix}$.

b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

533. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 0) in a 489 x 464 image with the following parameters? l=-4, r=0, b=1, t=2 view type = perspective
camera origin = $\begin{bmatrix}-4.0 & -1.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.62 & 0.15 & -0.77\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.6 & -0.75 & 0.3\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.15 & 0.62 & -0.77\end{bmatrix}$
image plane at distance 1 in front of viewpoint

534. Ray R has starting point e=$\begin{bmatrix}-4.48 & -3.04 & -1.85\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.0 & 0.55 & 0.83\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}6.82 & -2.29 & -8.9\end{bmatrix}$ $\begin{bmatrix}0.62 & -2.52 & -7.06\end{bmatrix}$ $\begin{bmatrix}3.38 & 2.98 & -2.48\end{bmatrix}$ $\begin{bmatrix}3.38 & 0.0 & -5.46\end{bmatrix}$ $\begin{bmatrix}2.69 & -2.06 & -7.29\end{bmatrix}$.

b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

535. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 1) in a 679 x 575 image with the following parameters? l=-2, r=4, b=-2, t=2 view type = perspective camera origin = $\begin{bmatrix}1.0 & 3.0 & -5.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.82 & -0.41 & 0.41\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.17 & 0.7 & -0.7\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.78 & -0.62 & 0.0\end{bmatrix}$
image plane at distance 4 in front of viewpoint

536. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 2) in a 489 x 511 image with the following parameters? l=-5, r=-4, b=-4, t=3 view type = perspective camera origin = $\begin{bmatrix}-5.0 & -1.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.45 & 0.0 & -0.89\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & 0.0 & 1.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.67 & -0.33 & 0.67\end{bmatrix}$
image plane at distance 1 in front of viewpoint

537. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 3) in a 523 x 639 image with the following parameters? l=-5, r=-2, b=1, t=3 view type = orthographic camera origin = $\begin{bmatrix}-2.0 & 3.0 & 0.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.0 & 1.0 & 0.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & 0.89 & -0.45\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.3 & -0.75 & -0.6\end{bmatrix}$

538. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 2) in a 253 x 594 image with the following parameters? l=-4, r=3, b=-3, t=2 view type = orthographic camera origin = $\begin{bmatrix}1.0 & 0.0 & 4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.3 & -0.9 & 0.3\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.46 & 0.46 & -0.76\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.2 & 0.78 & -0.59\end{bmatrix}$

539. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 3) in a 524 x 671 image with the following parameters? l=-1, r=1, b=3, t=4 view type = orthographic camera origin = $\begin{bmatrix}-2.0 & -4.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.33 & -0.67 & -0.67\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.73 & -0.49 & 0.49\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.35 & -0.87 & -0.35\end{bmatrix}$

540. Ray R has starting point e=$\begin{bmatrix}-7.22 & 1.99 & 2.83\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.56 & -0.37 & -0.74\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-5.0 & 1.03 & -5.0\end{bmatrix}$
$\begin{bmatrix}-1.88 & 2.28 & -2.5\end{bmatrix}$
$\begin{bmatrix}-5.78 & 1.03 & -5.62\end{bmatrix}$
$\begin{bmatrix}-1.1 & 3.38 & -1.88\end{bmatrix}$
$\begin{bmatrix}-1.1 & 2.13 & -1.88\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?

d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

541. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 3) in a 275 x 500 image with the following parameters? l=-3, r=-2, b=-4, t=4 view type = perspective camera origin = $\begin{bmatrix}-4.0 & 3.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.3 & -0.6 & -0.75\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & 0.51 & -0.86\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.87 & 0.22 & -0.44\end{bmatrix}$
image plane at distance 4 in front of viewpoint

542. Ray R has starting point e=$\begin{bmatrix}1.39 & 2.18 & 3.92\end{bmatrix}$
and direction d=$\begin{bmatrix}0.7 & 0.7 & 0.14\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}0.57 & 4.97 & 4.88\end{bmatrix}$
$\begin{bmatrix}1.79 & 4.24 & 1.97\end{bmatrix}$
$\begin{bmatrix}5.43 & 4.97 & 4.88\end{bmatrix}$
$\begin{bmatrix}4.46 & 3.76 & 0.03\end{bmatrix}$
$\begin{bmatrix}3.49 & 3.27 & -1.91\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

543. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 2) in a 526 x 330 image with the following parameters? l=0, r=1, b=1, t=2 view type = perspective camera origin = $\begin{bmatrix}1.0 & -4.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.47 & -0.62 & 0.62\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.97 & 0.0 & 0.24\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.71 & 0.71 & 0.0\end{bmatrix}$
image plane at distance 4 in front of viewpoint

544. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 3) in a 557 x 728 image with the following parameters? l=-2, r=-1, b=0, t=1 view type = perspective camera origin = $\begin{bmatrix}3.0 & -5.0 & 2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.0 & 0.0 & 1.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.19 & 0.19 & -0.96\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.22 & 0.87 & 0.44\end{bmatrix}$
image plane at distance 2 in front of viewpoint

545. Ray R has starting point e=$\begin{bmatrix}-7.36 & -3.1 & 0.77\end{bmatrix}$
and direction d=$\begin{bmatrix}0.82 & -0.41 & 0.41\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}3.5 & -7.22 & 3.66\end{bmatrix}$
$\begin{bmatrix}3.5 & -4.72 & 3.66\end{bmatrix}$
$\begin{bmatrix}-3.16 & -5.55 & -0.77\end{bmatrix}$
$\begin{bmatrix}-2.33 & -5.0 & -0.22\end{bmatrix}$
$\begin{bmatrix}-1.5 & -2.23 & 0.34\end{bmatrix}$
.

b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

546. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 0) in a 267 x 561 image with the following parameters? l=-4, r=-1, b=-5, t=2 view type = orthographic
camera origin = $\begin{bmatrix}-3.0 & 0.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.62 & -0.62 & -0.47\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & -0.86 & 0.51\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.62 & -0.15 & -0.77\end{bmatrix}$

547. Ray R has starting point e=$\begin{bmatrix}-3.86 & 3.96 & 0.25\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.3 & 0.3 & 0.9\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}1.2 & 4.2 & -4.6\end{bmatrix}$
$\begin{bmatrix}-0.6 & 2.8 & -2.2\end{bmatrix}$
$\begin{bmatrix}-0.6 & 3.6 & -2.2\end{bmatrix}$
$\begin{bmatrix}1.2 & 5.4 & -4.6\end{bmatrix}$
$\begin{bmatrix}1.8 & 2.0 & -5.4\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

548. Ray R has starting point e=$\begin{bmatrix}-4.18 & -1.72 & -1.97\end{bmatrix}$
and direction d=$\begin{bmatrix}0.97 & -0.0 & 0.24\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-1.3 & -0.64 & -1.81\end{bmatrix}$
$\begin{bmatrix}-5.77 & -1.39 & -3.0\end{bmatrix}$
$\begin{bmatrix}-1.45 & -2.58 & -0.32\end{bmatrix}$
$\begin{bmatrix}-1.75 & -2.73 & -0.32\end{bmatrix}$
$\begin{bmatrix}-2.19 & 4.88 & -6.58\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

549. Ray R has starting point e=$\begin{bmatrix}0.75 & 3.4 & 1.08\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.74 & -0.37 & -0.56\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-3.08 & 6.27 & 0.59\end{bmatrix}$
$\begin{bmatrix}-2.67 & 5.86 & 0.59\end{bmatrix}$
$\begin{bmatrix}1.0 & 1.37 & 0.18\end{bmatrix}$
$\begin{bmatrix}0.59 & 3.41 & 1.0\end{bmatrix}$
$\begin{bmatrix}2.63 & 1.37 & 1.0\end{bmatrix}$

.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

550. Ray R has starting point e=$\begin{bmatrix}-9.25 & -2.28 & 0.18\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.87 & 0.44 & 0.22\end{bmatrix}$ . Polygon P has vertices $\begin{bmatrix}-2.73 & -4.4 & 8.37\end{bmatrix}$ $\begin{bmatrix}-4.67 & -1.97 & 2.79\end{bmatrix}$ $\begin{bmatrix}-2.24 & -1.0 & 3.76\end{bmatrix}$ $\begin{bmatrix}-1.03 & 1.43 & 1.33\end{bmatrix}$ $\begin{bmatrix}-2.24 & -3.43 & 7.4\end{bmatrix}$ .
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

551. Ray R has starting point e=$\begin{bmatrix}-0.45 & 6.5 & -0.37\end{bmatrix}$ and direction d=$\begin{bmatrix}0.15 & -0.62 & 0.77\end{bmatrix}$ . Polygon P has vertices $\begin{bmatrix}5.75 & 2.61 & -1.61\end{bmatrix}$ $\begin{bmatrix}0.65 & 6.14 & -0.23\end{bmatrix}$ $\begin{bmatrix}3.2 & 3.2 & -1.8\end{bmatrix}$ $\begin{bmatrix}3.78 & 2.22 & -2.39\end{bmatrix}$ $\begin{bmatrix}2.8 & 2.02 & -2.78\end{bmatrix}$ .
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

552. Ray R has starting point e=$\begin{bmatrix}-2.54 & 5.47 & -3.15\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.0 & -0.37 & 0.93\end{bmatrix}$ . Polygon P has vertices $\begin{bmatrix}1.46 & 8.01 & -1.93\end{bmatrix}$ $\begin{bmatrix}0.99 & 6.31 & -2.09\end{bmatrix}$ $\begin{bmatrix}4.85 & 2.15 & 3.78\end{bmatrix}$ $\begin{bmatrix}3.62 & 3.38 & 1.93\end{bmatrix}$ $\begin{bmatrix}2.07 & 8.63 & -1.31\end{bmatrix}$ .
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

553. Ray R has starting point e=$\begin{bmatrix}-0.36 & -4.1 & -1.36\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.42 & 0.71 & 0.57\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}0.58 & 1.95 & -0.26\end{bmatrix}$ $\begin{bmatrix}0.58 & -5.32 & -0.26\end{bmatrix}$ $\begin{bmatrix}0.58 & 4.48 & -0.26\end{bmatrix}$ $\begin{bmatrix}0.58 & 3.21 & -0.26\end{bmatrix}$ $\begin{bmatrix}0.58 & 2.9 & -0.26\end{bmatrix}$.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

554. Ray R has starting point e=$\begin{bmatrix}2.74 & 0.29 & -2.86\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.87 & 0.22 & -0.44\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}1.05 & -2.79 & -4.26\end{bmatrix}$ $\begin{bmatrix}-1.48 & 2.9 & -2.37\end{bmatrix}$ $\begin{bmatrix}2.95 & 2.9 & -2.37\end{bmatrix}$ $\begin{bmatrix}-0.21 & -3.74 & -4.58\end{bmatrix}$ $\begin{bmatrix}1.68 & 1.95 & -2.68\end{bmatrix}$.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

555. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 3) in a 403 x 251 image with the following parameters? l=-2, r=-1, b=-4, t=1 view type = orthographic
camera origin = $\begin{bmatrix}-5.0 & 1.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.17 & -0.7 & -0.7\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.67 & 0.67 & -0.33\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.3 & -0.75 & 0.6\end{bmatrix}$

556. Ray R has starting point e=$\begin{bmatrix}-9.77 & 1.15 & 2.94\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.87 & 0.22 & -0.44\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-2.77 & 1.74 & -6.3\end{bmatrix}$ $\begin{bmatrix}-5.74 & 4.34 & -2.77\end{bmatrix}$ $\begin{bmatrix}-1.66 & -0.67 & -8.34\end{bmatrix}$ $\begin{bmatrix}-5.74 & 0.26 & -4.81\end{bmatrix}$ $\begin{bmatrix}-3.51 & -0.11 & -6.67\end{bmatrix}$.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

557. Ray R has starting point e=$\begin{bmatrix}4.48 & 2.04 & 1.85\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.24 & -0.0 & -0.97\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}4.98 & 2.39 & 0.49\end{bmatrix}$
$\begin{bmatrix}6.77 & 2.98 & 0.34\end{bmatrix}$
$\begin{bmatrix}1.25 & 0.89 & 0.49\end{bmatrix}$
$\begin{bmatrix}0.96 & -0.3 & -0.85\end{bmatrix}$
$\begin{bmatrix}-0.98 & 1.79 & 2.73\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

558. Ray R has starting point e=$\begin{bmatrix}-11.71 & 3.38 & -0.02\end{bmatrix}$
and direction d=$\begin{bmatrix}0.68 & -0.27 & 0.68\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-6.12 & -2.25 & 2.5\end{bmatrix}$
$\begin{bmatrix}-3.78 & 3.37 & 0.62\end{bmatrix}$
$\begin{bmatrix}-1.44 & -0.22 & -1.25\end{bmatrix}$
$\begin{bmatrix}-2.22 & 0.56 & -0.62\end{bmatrix}$
$\begin{bmatrix}-3.78 & -0.53 & 0.62\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

559. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 1) in a 624 x 621 image with the following parameters? l=-3, r=-2, b=0, t=4 view type = perspective
camera origin = $\begin{bmatrix}2.0 & 1.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.32 & 0.95 & 0.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.37 & -0.74 & -0.56\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.0 & -0.98 & 0.2\end{bmatrix}$
image plane at distance 2 in front of viewpoint

560. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 1) in a 419 x 374 image with the following parameters? l=-4, r=0, b=-2, t=-1 view type = orthographic
camera origin = $\begin{bmatrix}-2.0 & -3.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.93 & 0.37 & 0.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.58 & 0.58 & -0.58\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.82 & 0.41 & 0.41\end{bmatrix}$

561. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 4) in a 401 x 430 image with the following parameters? l=-2, r=4, b=-5, t=-2 view type = perspective
camera origin = $\begin{bmatrix}4.0 & 1.0 & 4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.0 & -0.89 & 0.45\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.7 & -0.7 & 0.17\end{bmatrix}$

camera w axis = $\begin{bmatrix}0.0 & -0.83 & 0.55\end{bmatrix}$
image plane at distance 2 in front of viewpoint

562. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 2) in a 557 x 652 image with the following parameters? l=-4, r=3, b=-5, t=-2 view type = perspective
camera origin = $\begin{bmatrix}-5.0 & 0.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.75 & -0.6 & 0.3\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.82 & -0.41 & -0.41\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.32 & 0.0 & 0.95\end{bmatrix}$
image plane at distance 0 in front of viewpoint

563. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 4) in a 600 x 662 image with the following parameters? l=0, r=2, b=-3, t=-1 view type = orthographic
camera origin = $\begin{bmatrix}-1.0 & -1.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.49 & -0.62 & -0.62\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.87 & -0.22 & 0.44\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.6 & 0.0 & 0.8\end{bmatrix}$

564. Ray R has starting point e=$\begin{bmatrix}-6.19 & 1.51 & -1.88\end{bmatrix}$
and direction d=$\begin{bmatrix}0.71 & -0.0 & 0.71\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-0.18 & 1.41 & -4.94\end{bmatrix}$
$\begin{bmatrix}-1.36 & 8.24 & -3.53\end{bmatrix}$
$\begin{bmatrix}-1.59 & 2.82 & -4.94\end{bmatrix}$
$\begin{bmatrix}4.77 & 4.0 & -3.06\end{bmatrix}$
$\begin{bmatrix}6.66 & 1.17 & -3.29\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

565. Ray R has starting point e=$\begin{bmatrix}1.32 & -2.11 & -1.75\end{bmatrix}$
and direction d=$\begin{bmatrix}0.6 & 0.8 & -0.0\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}1.11 & -0.37 & -1.07\end{bmatrix}$
$\begin{bmatrix}1.49 & 0.0 & -2.0\end{bmatrix}$
$\begin{bmatrix}3.9 & 0.0 & -2.0\end{bmatrix}$
$\begin{bmatrix}-0.37 & 1.11 & -4.79\end{bmatrix}$
$\begin{bmatrix}0.56 & 0.37 & -2.93\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

566. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 4) in a 357 x 690 image with the following parameters? l=1, r=2, b=-1, t=0 view type = perspective
camera origin = $\begin{bmatrix}2.0 & 1.0 & 4.0\end{bmatrix}$

camera u axis = $\begin{bmatrix}0.7 & 0.17 & 0.7\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.49 & -0.49 & -0.73\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.47 & 0.62 & 0.62\end{bmatrix}$
image plane at distance 0 in front of viewpoint

567. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 4) in a 571 x 382 image with the following parameters? l=-5, r=4, b=-3, t=1 view type = orthographic
camera origin = $\begin{bmatrix}0.0 & 3.0 & -5.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.53 & -0.27 & -0.8\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.62 & 0.62 & 0.47\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.71 & 0.57 & 0.42\end{bmatrix}$

568. Ray R has starting point e=$\begin{bmatrix}3.76 & -8.24 & -7.53\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.14 & 0.7 & 0.7\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}0.27 & -5.75 & -1.8\end{bmatrix}$
$\begin{bmatrix}3.22 & -3.0 & 0.35\end{bmatrix}$
$\begin{bmatrix}6.94 & -2.02 & -6.9\end{bmatrix}$
$\begin{bmatrix}0.86 & -5.75 & -3.57\end{bmatrix}$
$\begin{bmatrix}0.27 & -4.57 & 2.9\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

569. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 0) in a 518 x 704 image with the following parameters? l=-3, r=0, b=-5, t=-3 view type = orthographic
camera origin = $\begin{bmatrix}-5.0 & 1.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.41 & 0.41 & -0.82\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.41 & -0.41 & 0.82\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.49 & 0.73 & 0.49\end{bmatrix}$

570. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 0) in a 324 x 734 image with the following parameters? l=-4, r=4, b=0, t=1 view type = orthographic
camera origin = $\begin{bmatrix}-4.0 & -3.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.24 & 0.94 & -0.24\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.44 & -0.87 & 0.22\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.71 & -0.42 & -0.57\end{bmatrix}$

571. Ray R has starting point e=$\begin{bmatrix}3.23 & -5.72 & 1.33\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.8 & 0.27 & 0.53\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}3.94 & -7.14 & 6.54\end{bmatrix}$
$\begin{bmatrix}1.27 & -7.67 & -2.54\end{bmatrix}$
$\begin{bmatrix}-1.67 & -0.46 & 3.07\end{bmatrix}$
$\begin{bmatrix}1.27 & -4.73 & 3.34\end{bmatrix}$
$\begin{bmatrix}0.73 & -5.8 & -0.41\end{bmatrix}$

.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

572. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 3) in a 342 x 256 image with the following parameters? l=-3, r=1, b=1, t=4 view type = perspective camera origin = $\begin{bmatrix}-2.0 & 0.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.67 & 0.33 & -0.67\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.15 & 0.62 & -0.77\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.3 & 0.6 & -0.75\end{bmatrix}$
image plane at distance 2 in front of viewpoint

573. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 2) in a 393 x 453 image with the following parameters? l=-1, r=1, b=4, t=5 view type = orthographic camera origin = $\begin{bmatrix}-4.0 & 2.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.0 & -0.6 & -0.8\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & 0.95 & 0.32\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.37 & -0.93 & 0.0\end{bmatrix}$

574. Ray R has starting point e=$\begin{bmatrix}-2.06 & 1.2 & 4.83\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.71 & -0.0 & -0.71\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}1.67 & 3.0 & 5.33\end{bmatrix}$
$\begin{bmatrix}3.0 & 1.33 & 4.67\end{bmatrix}$
$\begin{bmatrix}2.33 & 0.33 & 1.33\end{bmatrix}$
$\begin{bmatrix}3.33 & 0.67 & 4.0\end{bmatrix}$
$\begin{bmatrix}4.33 & 1.0 & 6.67\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

575. Ray R has starting point e=$\begin{bmatrix}-14.25 & -4.08 & 0.1\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.71 & -0.0 & 0.71\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-2.84 & 0.14 & -5.78\end{bmatrix}$
$\begin{bmatrix}-2.45 & -0.84 & -1.27\end{bmatrix}$
$\begin{bmatrix}-4.41 & -3.2 & -2.06\end{bmatrix}$
$\begin{bmatrix}-7.35 & -6.92 & -2.65\end{bmatrix}$
$\begin{bmatrix}-2.45 & -0.45 & -2.45\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?

f) Is the intersection point in front of the viewpoint e?

576. Ray R has starting point e=$\begin{bmatrix}-9.81 & 3.41 & 1.9\end{bmatrix}$
and direction d=$\begin{bmatrix}0.64 & 0.43 & -0.64\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}6.6 & 0.11 & 3.35\end{bmatrix}$
$\begin{bmatrix}1.08 & 7.24 & 6.43\end{bmatrix}$
$\begin{bmatrix}4.97 & 0.76 & 6.43\end{bmatrix}$
$\begin{bmatrix}1.73 & 6.92 & 5.3\end{bmatrix}$
$\begin{bmatrix}4.32 & 2.05 & 6.11\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

577. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 0) in a 659 x 533 image with the following parameters? l=-1, r=0, b=-5, t=2 view type = perspective camera origin = $\begin{bmatrix}-1.0 & -5.0 & -5.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.67 & -0.33 & -0.67\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.62 & -0.78 & 0.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.47 & 0.62 & 0.62\end{bmatrix}$
image plane at distance 3 in front of viewpoint

578. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 2) in a 442 x 389 image with the following parameters? l=1, r=3, b=0, t=1 view type = perspective camera origin = $\begin{bmatrix}1.0 & -1.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.15 & -0.77 & -0.62\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.2 & -0.59 & -0.78\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.93 & 0.37 & 0.0\end{bmatrix}$
image plane at distance 1 in front of viewpoint

579. Ray R has starting point e=$\begin{bmatrix}-4.6 & 4.78 & 2.67\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.69 & 0.23 & -0.69\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}5.21 & 1.57 & -5.85\end{bmatrix}$
$\begin{bmatrix}4.73 & 4.97 & -3.91\end{bmatrix}$
$\begin{bmatrix}3.76 & 3.51 & -0.03\end{bmatrix}$
$\begin{bmatrix}3.03 & 6.91 & 2.88\end{bmatrix}$
$\begin{bmatrix}3.03 & 3.27 & 2.88\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

580. Ray R has starting point e=$\begin{bmatrix}1.33 & -6.17 & 1.72\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.69 & -0.23 & 0.69\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}0.0 & -2.0 & 4.0\end{bmatrix}$
$\begin{bmatrix}-1.0 & -9.0 & 4.0\end{bmatrix}$

$\begin{bmatrix}-8.0 & -7.0 & 4.0\end{bmatrix}$
$\begin{bmatrix}-2.0 & -1.0 & 4.0\end{bmatrix}$
$\begin{bmatrix}-4.0 & -3.0 & 4.0\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

581. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 2) in a 468 x 657 image with the following parameters? l=-3, r=-1, b=0, t=2 view type = perspective camera origin = $\begin{bmatrix}-5.0 & 4.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.6 & -0.3 & -0.75\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.41 & -0.82 & 0.41\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.74 & 0.37 & -0.56\end{bmatrix}$
image plane at distance 4 in front of viewpoint

582. Ray R has starting point e=$\begin{bmatrix}-1.6 & -4.65 & -1.53\end{bmatrix}$
and direction d=$\begin{bmatrix}0.87 & 0.44 & -0.22\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-1.75 & -5.62 & -0.72\end{bmatrix}$
$\begin{bmatrix}0.91 & -3.13 & -1.5\end{bmatrix}$
$\begin{bmatrix}3.56 & -1.88 & -3.22\end{bmatrix}$
$\begin{bmatrix}2.62 & -7.5 & -6.5\end{bmatrix}$
$\begin{bmatrix}2.62 & -4.38 & -4.16\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

583. Ray R has starting point e=$\begin{bmatrix}-1.12 & 0.69 & -2.68\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.0 & -0.0 & -1.0\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-3.65 & -5.71 & 0.89\end{bmatrix}$
$\begin{bmatrix}-2.24 & 0.65 & 1.59\end{bmatrix}$
$\begin{bmatrix}-0.35 & 1.59 & -5.01\end{bmatrix}$
$\begin{bmatrix}-3.18 & -0.53 & 4.19\end{bmatrix}$
$\begin{bmatrix}-3.18 & -2.89 & 1.83\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

584. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 4) in a 561 x 495 image with the following parameters? l=-5, r=1, b=0, t=1 view type = perspective camera origin = $\begin{bmatrix}1.0 & -3.0 & 3.0\end{bmatrix}$

camera u axis = $\begin{bmatrix}0.24 & 0.24 & 0.94\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & 0.71 & -0.71\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.62 & -0.62 & -0.49\end{bmatrix}$
image plane at distance 4 in front of viewpoint

585. Ray R has starting point e=$\begin{bmatrix}-2.86 & -2.97 & -6.29\end{bmatrix}$
and direction d=$\begin{bmatrix}0.3 & -0.9 & -0.3\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-0.44 & -5.19 & -9.2\end{bmatrix}$
$\begin{bmatrix}0.29 & -4.46 & -7.01\end{bmatrix}$
$\begin{bmatrix}-5.37 & -2.45 & -4.82\end{bmatrix}$
$\begin{bmatrix}-5.56 & -3.0 & -6.28\end{bmatrix}$
$\begin{bmatrix}-6.65 & -1.9 & -4.09\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

586. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 2) in a 264 x 358 image with the following parameters? l=-1, r=0, b=-3, t=4 view type = perspective
camera origin = $\begin{bmatrix}3.0 & -2.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.65 & -0.65 & -0.39\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.24 & 0.94 & -0.24\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.71 & -0.42 & 0.57\end{bmatrix}$
image plane at distance 4 in front of viewpoint

587. Ray R has starting point e=$\begin{bmatrix}1.47 & -2.81 & 4.51\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.71 & -0.0 & -0.71\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}2.53 & -3.44 & 5.69\end{bmatrix}$
$\begin{bmatrix}1.11 & -3.44 & 4.56\end{bmatrix}$
$\begin{bmatrix}0.97 & -2.45 & 3.85\end{bmatrix}$
$\begin{bmatrix}-3.41 & -5.0 & 1.87\end{bmatrix}$
$\begin{bmatrix}1.96 & -5.85 & 6.68\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

588. Ray R has starting point e=$\begin{bmatrix}4.1 & 2.15 & 2.83\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.3 & -0.3 & -0.9\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}5.83 & 4.24 & 0.17\end{bmatrix}$
$\begin{bmatrix}0.17 & 5.66 & 5.83\end{bmatrix}$
$\begin{bmatrix}0.17 & -4.95 & 5.83\end{bmatrix}$
$\begin{bmatrix}5.83 & -6.36 & 0.17\end{bmatrix}$
$\begin{bmatrix}0.88 & 0.71 & 5.12\end{bmatrix}$
.

b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

589. Ray R has starting point e=$\begin{bmatrix}-0.06 & -4.94 & 0.49\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.44 & -0.22 & 0.87\end{bmatrix}$ . Polygon P has vertices $\begin{bmatrix}-1.87 & -5.31 & 2.56\end{bmatrix}$ $\begin{bmatrix}0.31 & -7.71 & 0.82\end{bmatrix}$ $\begin{bmatrix}1.18 & -3.35 & 2.78\end{bmatrix}$ $\begin{bmatrix}-2.75 & -0.51 & 5.18\end{bmatrix}$ $\begin{bmatrix}-1.44 & -8.58 & 0.82\end{bmatrix}$ .
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

590. Ray R has starting point e=$\begin{bmatrix}-7.2 & 4.0 & 1.0\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.8 & 0.6 & -0.0\end{bmatrix}$ . Polygon P has vertices $\begin{bmatrix}0.19 & 6.93 & -1.1\end{bmatrix}$ $\begin{bmatrix}-1.63 & 1.09 & -3.65\end{bmatrix}$ $\begin{bmatrix}-1.82 & -0.19 & -5.29\end{bmatrix}$ $\begin{bmatrix}-2.55 & -1.83 & -4.93\end{bmatrix}$ $\begin{bmatrix}-2.37 & 3.28 & 4.38\end{bmatrix}$ .
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

591. Ray R has starting point e=$\begin{bmatrix}-7.23 & -2.53 & 1.8\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.67 & -0.33 & -0.67\end{bmatrix}$ . Polygon P has vertices $\begin{bmatrix}0.71 & -2.29 & 3.29\end{bmatrix}$ $\begin{bmatrix}0.0 & -1.59 & 4.0\end{bmatrix}$ $\begin{bmatrix}-1.41 & -5.12 & 5.41\end{bmatrix}$ $\begin{bmatrix}-3.54 & -3.0 & 7.54\end{bmatrix}$ $\begin{bmatrix}-0.71 & -5.12 & 4.71\end{bmatrix}$ .
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

592. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 2) in a 542

x 431 image with the following parameters? l=0, r=1, b=-1, t=0 view type = perspective
camera origin = $\begin{bmatrix}-4.0 & -4.0 & 2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.32 & 0.49 & -0.81\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.37 & -0.56 & -0.74\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.6 & -0.75 & -0.3\end{bmatrix}$
image plane at distance 3 in front of viewpoint

593. Ray R has starting point e=$\begin{bmatrix}-11.67 & -6.42 & -1.33\end{bmatrix}$
and direction d=$\begin{bmatrix}0.35 & -0.35 & 0.87\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-3.27 & -7.92 & -2.89\end{bmatrix}$
$\begin{bmatrix}2.57 & -1.76 & 3.76\end{bmatrix}$
$\begin{bmatrix}-4.57 & -7.6 & -0.14\end{bmatrix}$
$\begin{bmatrix}-3.11 & -5.81 & 2.14\end{bmatrix}$
$\begin{bmatrix}-3.27 & -7.6 & -2.08\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

594. Ray R has starting point e=$\begin{bmatrix}-11.34 & 6.78 & 0.11\end{bmatrix}$
and direction d=$\begin{bmatrix}0.77 & -0.62 & 0.15\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-1.68 & 5.34 & -1.45\end{bmatrix}$
$\begin{bmatrix}-1.68 & 5.34 & 3.02\end{bmatrix}$
$\begin{bmatrix}4.58 & 2.21 & -0.55\end{bmatrix}$
$\begin{bmatrix}2.79 & 3.11 & -5.02\end{bmatrix}$
$\begin{bmatrix}2.79 & 3.11 & 2.58\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

595. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 2) in a 372 x 292 image with the following parameters? l=-3, r=0, b=-4, t=0 view type = orthographic
camera origin = $\begin{bmatrix}3.0 & 0.0 & 2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.62 & 0.47 & 0.62\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.87 & 0.22 & 0.44\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.58 & 0.58 & -0.58\end{bmatrix}$

596. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 4) in a 288 x 250 image with the following parameters? l=-4, r=3, b=-4, t=-1 view type = orthographic
camera origin = $\begin{bmatrix}-2.0 & -2.0 & 0.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.49 & -0.49 & 0.73\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.9 & -0.3 & -0.3\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.59 & 0.78 & -0.2\end{bmatrix}$

597. Ray R has starting point e=$\begin{bmatrix}-6.44 & -7.86 & -0.82\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.22 & 0.87 & 0.44\end{bmatrix}$ . Polygon P has vertices $\begin{bmatrix}-2.28 & -0.52 & -7.62\end{bmatrix}$ $\begin{bmatrix}-5.48 & -4.79 & -1.23\end{bmatrix}$ $\begin{bmatrix}-3.56 & -3.29 & -4.0\end{bmatrix}$ $\begin{bmatrix}-4.2 & -1.8 & -5.07\end{bmatrix}$ $\begin{bmatrix}2.2 & -2.87 & -8.26\end{bmatrix}$ .
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

598. Ray R has starting point e=$\begin{bmatrix}-6.92 & -1.33 & -5.62\end{bmatrix}$ and direction d=$\begin{bmatrix}0.58 & -0.58 & 0.58\end{bmatrix}$ . Polygon P has vertices $\begin{bmatrix}-0.89 & -5.11 & -4.56\end{bmatrix}$ $\begin{bmatrix}-7.96 & 1.39 & -1.73\end{bmatrix}$ $\begin{bmatrix}-7.11 & -2.85 & -6.39\end{bmatrix}$ $\begin{bmatrix}-3.86 & -0.16 & -0.6\end{bmatrix}$ $\begin{bmatrix}-4.85 & -4.55 & -6.82\end{bmatrix}$ .
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

599. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 2) in a 558 x 667 image with the following parameters? l=-4, r=1, b=-5, t=1 view type = orthographic camera origin = $\begin{bmatrix}2.0 & -3.0 & 3.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.73 & 0.49 & -0.49\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.62 & 0.15 & -0.77\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.8 & 0.0 & 0.6\end{bmatrix}$

600. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 2) in a 622 x 489 image with the following parameters? l=-2, r=-1, b=-3, t=1 view type = perspective camera origin = $\begin{bmatrix}3.0 & -4.0 & 4.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.8 & 0.6 & 0.0\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.3 & -0.3 & 0.9\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.32 & -0.81 & -0.49\end{bmatrix}$ image plane at distance 2 in front of viewpoint

601. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 4) in a 298 x 484 image with the following parameters? l=-2, r=2, b=-2, t=2 view type = orthographic camera origin = $\begin{bmatrix}3.0 & 3.0 & -5.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.43 & 0.64 & -0.64\end{bmatrix}$

camera v axis = $\begin{bmatrix}0.0 & -0.83 & 0.55\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.71 & -0.71 & 0.0\end{bmatrix}$

602. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 4) in a 375 x 292 image with the following parameters? l=-4, r=1, b=-4, t=2 view type = perspective
camera origin = $\begin{bmatrix}0.0 & -5.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.75 & -0.6 & -0.3\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.62 & -0.78 & 0.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.0 & -0.86 & 0.51\end{bmatrix}$
image plane at distance 2 in front of viewpoint

603. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 1) in a 254 x 534 image with the following parameters? l=1, r=4, b=-5, t=-3 view type = perspective
camera origin = $\begin{bmatrix}2.0 & 3.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.43 & -0.64 & 0.64\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.56 & 0.37 & 0.74\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.89 & -0.45 & 0.0\end{bmatrix}$
image plane at distance 3 in front of viewpoint

604. Ray R has starting point e=$\begin{bmatrix}-2.38 & -1.03 & 1.09\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.87 & 0.44 & -0.22\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-5.0 & 2.0 & 3.0\end{bmatrix}$
$\begin{bmatrix}-5.0 & 6.0 & 3.0\end{bmatrix}$
$\begin{bmatrix}-5.0 & -1.0 & -1.0\end{bmatrix}$
$\begin{bmatrix}-5.0 & -3.0 & -1.0\end{bmatrix}$
$\begin{bmatrix}-5.0 & -3.0 & 4.0\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

605. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 3) in a 559 x 353 image with the following parameters? l=-1, r=1, b=-1, t=3 view type = orthographic
camera origin = $\begin{bmatrix}-5.0 & -5.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.97 & 0.0 & -0.24\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.73 & 0.49 & 0.49\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.0 & -0.51 & -0.86\end{bmatrix}$

606. Ray R has starting point e=$\begin{bmatrix}2.71 & 4.59 & -1.39\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.58 & -0.58 & 0.58\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}1.09 & 3.31 & 1.06\end{bmatrix}$
$\begin{bmatrix}0.22 & 2.0 & -2.44\end{bmatrix}$
$\begin{bmatrix}2.18 & 3.75 & 0.62\end{bmatrix}$
$\begin{bmatrix}0.0 & 0.69 & -7.24\end{bmatrix}$
$\begin{bmatrix}5.24 & 3.09 & -8.11\end{bmatrix}$
.

b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

607. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 4) in a 325 x 677 image with the following parameters? l=1, r=2, b=-5, t=-1 view type = orthographic camera origin = $\begin{bmatrix}-3.0 & -3.0 & 4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.53 & -0.66 & -0.53\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & 0.37 & -0.93\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.71 & 0.0 & 0.71\end{bmatrix}$

608. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 0) in a 443 x 350 image with the following parameters? l=-4, r=2, b=-1, t=4 view type = orthographic camera origin = $\begin{bmatrix}-2.0 & 0.0 & 2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.82 & 0.41 & 0.41\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.7 & -0.17 & 0.7\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.71 & -0.42 & -0.57\end{bmatrix}$

609. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 0) in a 450 x 577 image with the following parameters? l=-3, r=1, b=-2, t=1 view type = perspective camera origin = $\begin{bmatrix}-4.0 & -1.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.7 & 0.17 & -0.7\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.66 & -0.53 & -0.53\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.62 & 0.47 & 0.62\end{bmatrix}$
image plane at distance 3 in front of viewpoint

610. Ray R has starting point e=$\begin{bmatrix}-12.57 & 1.7 & 2.25\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.64 & -0.64 & -0.43\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-4.67 & -1.33 & -3.0\end{bmatrix}$
$\begin{bmatrix}-2.0 & -0.67 & -3.67\end{bmatrix}$
$\begin{bmatrix}-4.0 & -3.67 & -5.67\end{bmatrix}$
$\begin{bmatrix}-6.0 & -3.0 & -4.0\end{bmatrix}$
$\begin{bmatrix}-0.67 & 0.33 & -3.33\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

611. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 1) in a 670 x 630 image with the following parameters? l=-5, r=1, b=-1, t=0 view type = perspective camera origin = $\begin{bmatrix}-4.0 & 1.0 & 0.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.71 & 0.0 & -0.71\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.24 & 0.94 & 0.24\end{bmatrix}$

camera w axis = $\begin{bmatrix}0.0 & -0.71 & 0.71\end{bmatrix}$
image plane at distance 3 in front of viewpoint

612. Ray R has starting point e=$\begin{bmatrix}-8.11 & 5.61 & 3.51\end{bmatrix}$
and direction d=$\begin{bmatrix}0.71 & -0.57 & 0.42\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-0.53 & 1.87 & 5.07\end{bmatrix}$
$\begin{bmatrix}-4.0 & 2.67 & 8.01\end{bmatrix}$
$\begin{bmatrix}-3.47 & 1.6 & 6.14\end{bmatrix}$
$\begin{bmatrix}-6.67 & -2.67 & 1.33\end{bmatrix}$
$\begin{bmatrix}-0.26 & -1.07 & 0.53\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

613. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 0) in a 341 x 442 image with the following parameters? l=1, r=4, b=1, t=3 view type = perspective
camera origin = $\begin{bmatrix}-1.0 & -4.0 & -5.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.69 & -0.23 & 0.69\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.65 & -0.65 & -0.39\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.91 & 0.18 & 0.37\end{bmatrix}$
image plane at distance 0 in front of viewpoint

614. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 1) in a 345 x 436 image with the following parameters? l=0, r=4, b=-2, t=0 view type = orthographic
camera origin = $\begin{bmatrix}1.0 & 3.0 & 2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.0 & -0.71 & 0.71\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.7 & 0.7 & 0.17\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.71 & 0.0 & -0.71\end{bmatrix}$

615. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 4) in a 254 x 338 image with the following parameters? l=-3, r=3, b=-5, t=4 view type = perspective
camera origin = $\begin{bmatrix}4.0 & -4.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.0 & 0.71 & -0.71\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.56 & 0.37 & 0.74\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.62 & 0.62 & -0.47\end{bmatrix}$
image plane at distance 4 in front of viewpoint

616. Ray R has starting point e=$\begin{bmatrix}-11.03 & -2.81 & 1.0\end{bmatrix}$
and direction d=$\begin{bmatrix}0.98 & -0.2 & -0.0\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}0.83 & -0.43 & -1.7\end{bmatrix}$
$\begin{bmatrix}5.18 & -3.91 & 1.44\end{bmatrix}$
$\begin{bmatrix}2.39 & -5.83 & 1.09\end{bmatrix}$
$\begin{bmatrix}3.79 & -2.7 & 0.39\end{bmatrix}$
$\begin{bmatrix}-1.09 & -1.48 & -2.04\end{bmatrix}$
.
b) What is the normal to P?

c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

617. Ray R has starting point e=$\begin{bmatrix}-6.56 & -1.87 & 1.31\end{bmatrix}$ and direction d=$\begin{bmatrix}0.56 & 0.74 & -0.37\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}2.16 & -1.77 & -1.71\end{bmatrix}$ $\begin{bmatrix}0.5 & -0.66 & 1.61\end{bmatrix}$ $\begin{bmatrix}-2.83 & 1.55 & 3.28\end{bmatrix}$ $\begin{bmatrix}2.16 & -1.77 & -1.16\end{bmatrix}$ $\begin{bmatrix}-2.83 & 1.55 & 3.55\end{bmatrix}$.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

618. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 3) in a 389 x 259 image with the following parameters? l=-4, r=-1, b=-5, t=1 view type = orthographic
camera origin = $\begin{bmatrix}-4.0 & -5.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.37 & -0.93 & 0.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.85 & 0.17 & -0.51\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.51 & -0.51 & 0.69\end{bmatrix}$

619. Ray R has starting point e=$\begin{bmatrix}-6.61 & -10.35 & 1.7\end{bmatrix}$ and direction d=$\begin{bmatrix}0.37 & 0.91 & -0.18\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}6.86 & -3.46 & 2.39\end{bmatrix}$ $\begin{bmatrix}7.17 & -8.55 & 1.62\end{bmatrix}$ $\begin{bmatrix}5.31 & -6.54 & 0.54\end{bmatrix}$ $\begin{bmatrix}3.31 & -7.78 & -1.31\end{bmatrix}$ $\begin{bmatrix}5.62 & -4.69 & 1.16\end{bmatrix}$.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

620. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 1) in a 679 x 351 image with the following parameters? l=-4, r=-1, b=-4, t=-2 view type = orthographic
camera origin = $\begin{bmatrix}-4.0 & 3.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.0 & -0.83 & 0.55\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.8 & 0.53 & -0.27\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.17 & -0.51 & -0.85\end{bmatrix}$

621. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 3) in a 260 x 637 image with the following parameters? l=-3, r=1, b=-4, t=3 view type = perspective
camera origin = $\begin{bmatrix}-5.0 & 0.0 & 0.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.0 & 0.71 & 0.71\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.49 & -0.81 & -0.32\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.89 & 0.0 & -0.45\end{bmatrix}$
image plane at distance 4 in front of viewpoint

622. Ray R has starting point e=$\begin{bmatrix}7.98 & 2.03 & 0.15\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.58 & 0.58 & 0.58\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}8.12 & 0.09 & 4.24\end{bmatrix}$
$\begin{bmatrix}6.67 & 4.46 & -0.85\end{bmatrix}$
$\begin{bmatrix}7.15 & 2.03 & 2.3\end{bmatrix}$
$\begin{bmatrix}5.7 & 1.54 & 4.49\end{bmatrix}$
$\begin{bmatrix}5.7 & 1.54 & 4.49\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

623. Ray R has starting point e=$\begin{bmatrix}-4.92 & -2.19 & 1.93\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.0 & -0.83 & 0.55\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-2.59 & -3.9 & 2.7\end{bmatrix}$
$\begin{bmatrix}-6.21 & -2.4 & 3.6\end{bmatrix}$
$\begin{bmatrix}-5.6 & -3.0 & 2.4\end{bmatrix}$
$\begin{bmatrix}-7.11 & -1.19 & 6.32\end{bmatrix}$
$\begin{bmatrix}-1.68 & -3.6 & 4.51\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

624. Ray R has starting point e=$\begin{bmatrix}6.28 & -6.4 & 4.6\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.6 & 0.75 & -0.3\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}3.4 & -3.19 & 3.15\end{bmatrix}$
$\begin{bmatrix}5.19 & 0.68 & 2.85\end{bmatrix}$
$\begin{bmatrix}3.4 & -2.89 & 3.3\end{bmatrix}$
$\begin{bmatrix}6.09 & -0.96 & 0.91\end{bmatrix}$
$\begin{bmatrix}4.89 & -0.36 & 2.7\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

625. Ray R has starting point e=$\begin{bmatrix}-8.42 & -1.07 & -2.96\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.0 & -0.37 & 0.93\end{bmatrix}$ . Polygon P has vertices $\begin{bmatrix}-5.59 & 4.78 & -0.79\end{bmatrix}$ $\begin{bmatrix}-0.29 & -3.3 & 0.66\end{bmatrix}$ $\begin{bmatrix}-5.06 & 4.52 & -1.19\end{bmatrix}$ $\begin{bmatrix}-4.0 & 3.46 & -1.46\end{bmatrix}$ $\begin{bmatrix}-2.94 & 1.6 & -0.93\end{bmatrix}$ .
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

626. Ray R has starting point e=$\begin{bmatrix}2.44 & -2.8 & -1.47\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.35 & 0.87 & 0.35\end{bmatrix}$ . Polygon P has vertices $\begin{bmatrix}-1.12 & 2.12 & 3.95\end{bmatrix}$ $\begin{bmatrix}4.54 & -3.54 & -3.12\end{bmatrix}$ $\begin{bmatrix}1.0 & 0.0 & -0.29\end{bmatrix}$ $\begin{bmatrix}2.41 & -1.41 & 0.41\end{bmatrix}$ $\begin{bmatrix}-1.12 & 2.12 & 0.41\end{bmatrix}$ .
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

627. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 0) in a 581 x 630 image with the following parameters? l=0, r=1, b=2, t=3 view type = orthographic
camera origin = $\begin{bmatrix}-4.0 & -5.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.58 & 0.58 & -0.58\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.33 & 0.67 & 0.67\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.8 & -0.53 & -0.27\end{bmatrix}$

628. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 1) in a 344 x 282 image with the following parameters? l=1, r=4, b=1, t=3 view type = orthographic
camera origin = $\begin{bmatrix}1.0 & 3.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.91 & 0.18 & 0.37\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.64 & -0.64 & 0.43\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.98 & -0.2 & 0.0\end{bmatrix}$

629. Ray R has starting point e=$\begin{bmatrix}-10.18 & -1.57 & 1.15\end{bmatrix}$ and direction d=$\begin{bmatrix}0.18 & 0.91 & -0.37\end{bmatrix}$ . Polygon P has vertices $\begin{bmatrix}-1.86 & -1.27 & -0.34\end{bmatrix}$ $\begin{bmatrix}-2.13 & 0.07 & -0.6\end{bmatrix}$ $\begin{bmatrix}-2.93 & 3.28 & -1.14\end{bmatrix}$

$\begin{bmatrix}-7.74 & -0.73 & 3.41\end{bmatrix}$
$\begin{bmatrix}-6.67 & -1.27 & 2.87\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

630. Ray R has starting point e=$\begin{bmatrix}-1.81 & -4.85 & 0.79\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.37 & 0.56 & 0.74\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}1.54 & -0.68 & 8.0\end{bmatrix}$
$\begin{bmatrix}-5.76 & -3.11 & 3.14\end{bmatrix}$
$\begin{bmatrix}-7.54 & -1.97 & -2.38\end{bmatrix}$
$\begin{bmatrix}-4.3 & -1.65 & 1.68\end{bmatrix}$
$\begin{bmatrix}-6.08 & -2.46 & 1.03\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

631. Ray R has starting point e=$\begin{bmatrix}-10.45 & -6.34 & 3.6\end{bmatrix}$
and direction d=$\begin{bmatrix}0.85 & 0.17 & -0.51\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-0.66 & -1.13 & 2.94\end{bmatrix}$
$\begin{bmatrix}-2.53 & -2.73 & 1.87\end{bmatrix}$
$\begin{bmatrix}-3.6 & -4.6 & -1.6\end{bmatrix}$
$\begin{bmatrix}-0.4 & -1.4 & 1.6\end{bmatrix}$
$\begin{bmatrix}-5.74 & -5.94 & -1.34\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

632. Ray R has starting point e=$\begin{bmatrix}-4.5 & -5.38 & 1.76\end{bmatrix}$
and direction d=$\begin{bmatrix}0.87 & -0.44 & -0.22\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}5.57 & -3.0 & 3.57\end{bmatrix}$
$\begin{bmatrix}0.94 & -4.54 & 1.0\end{bmatrix}$
$\begin{bmatrix}1.97 & -4.54 & 2.03\end{bmatrix}$
$\begin{bmatrix}7.8 & -2.49 & 5.12\end{bmatrix}$
$\begin{bmatrix}0.43 & -7.12 & 3.92\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?

f) Is the intersection point in front of the viewpoint e?

633. Ray R has starting point e=$\begin{bmatrix}-0.43 & 1.43 & 0.28\end{bmatrix}$
and direction d=$\begin{bmatrix}0.24 & -0.0 & 0.97\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}2.15 & -0.59 & 4.12\end{bmatrix}$
$\begin{bmatrix}6.82 & 1.54 & -0.12\end{bmatrix}$
$\begin{bmatrix}5.12 & -3.56 & -1.82\end{bmatrix}$
$\begin{bmatrix}3.0 & -4.26 & 0.3\end{bmatrix}$
$\begin{bmatrix}4.56 & 0.4 & 1.86\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

634. Ray R has starting point e=$\begin{bmatrix}-12.67 & -0.4 & 0.6\end{bmatrix}$
and direction d=$\begin{bmatrix}0.7 & 0.7 & 0.17\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}0.02 & 4.57 & 1.64\end{bmatrix}$
$\begin{bmatrix}5.35 & 0.0 & -0.65\end{bmatrix}$
$\begin{bmatrix}-1.51 & 2.29 & -3.7\end{bmatrix}$
$\begin{bmatrix}5.05 & -2.74 & -5.52\end{bmatrix}$
$\begin{bmatrix}-0.44 & 2.29 & -2.63\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

635. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 1) in a 411 x 700 image with the following parameters? l=-1, r=3, b=0, t=1 view type = orthographic
camera origin = $\begin{bmatrix}3.0 & 3.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.69 & -0.69 & -0.23\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.81 & 0.49 & -0.32\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.71 & -0.71 & 0.0\end{bmatrix}$

636. Ray R has starting point e=$\begin{bmatrix}2.5 & 2.86 & -0.04\end{bmatrix}$
and direction d=$\begin{bmatrix}0.19 & -0.19 & 0.96\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}2.67 & 2.04 & 1.82\end{bmatrix}$
$\begin{bmatrix}-1.82 & 2.45 & -0.63\end{bmatrix}$
$\begin{bmatrix}4.31 & 6.12 & 0.59\end{bmatrix}$
$\begin{bmatrix}-0.59 & 1.22 & 0.59\end{bmatrix}$
$\begin{bmatrix}-1.82 & 1.63 & -0.22\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?

e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

637. Ray R has starting point e=$\begin{bmatrix}-1.18 & -4.12 & 1.59\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.83 & -0.0 & -0.55\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}5.43 & -4.0 & 1.0\end{bmatrix}$
$\begin{bmatrix}6.88 & -7.88 & 0.03\end{bmatrix}$
$\begin{bmatrix}7.12 & -5.94 & 0.51\end{bmatrix}$
$\begin{bmatrix}7.12 & -7.88 & 0.03\end{bmatrix}$
$\begin{bmatrix}-1.37 & -3.03 & 1.24\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

638. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 0) in a 270 x 392 image with the following parameters? l=-4, r=4, b=-4, t=4 view type = orthographic
camera origin = $\begin{bmatrix}3.0 & 0.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.85 & 0.17 & 0.51\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.87 & 0.22 & 0.44\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.56 & 0.74 & -0.37\end{bmatrix}$

639. Ray R has starting point e=$\begin{bmatrix}-10.37 & 1.61 & -0.28\end{bmatrix}$
and direction d=$\begin{bmatrix}0.45 & -0.0 & 0.89\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-4.63 & 0.81 & 4.93\end{bmatrix}$
$\begin{bmatrix}-6.86 & -0.67 & -0.64\end{bmatrix}$
$\begin{bmatrix}-5.74 & 3.41 & 2.14\end{bmatrix}$
$\begin{bmatrix}-5.37 & -1.6 & 3.07\end{bmatrix}$
$\begin{bmatrix}-3.89 & 0.07 & 6.79\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

640. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 1) in a 414 x 654 image with the following parameters? l=-2, r=3, b=-5, t=3 view type = perspective
camera origin = $\begin{bmatrix}-3.0 & -1.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.64 & -0.43 & -0.64\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.51 & -0.51 & -0.69\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.45 & -0.89 & 0.0\end{bmatrix}$
image plane at distance 1 in front of viewpoint

641. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 1) in a 332 x 586 image with the following parameters? l=-5, r=-4, b=-1, t=3 view type = orthographic
camera origin = $\begin{bmatrix}-5.0 & 3.0 & -3.0\end{bmatrix}$

camera u axis = $\begin{bmatrix}-0.18 & 0.37 & -0.91\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.67 & 0.33 & 0.67\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.23 & -0.69 & -0.69\end{bmatrix}$

642. Ray R has starting point e=$\begin{bmatrix}0.02 & 5.15 & 2.7\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.0 & -0.89 & 0.45\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-1.3 & 0.77 & 1.26\end{bmatrix}$
$\begin{bmatrix}2.04 & 5.6 & 1.81\end{bmatrix}$
$\begin{bmatrix}0.74 & 7.46 & 7.2\end{bmatrix}$
$\begin{bmatrix}0.74 & 7.46 & 7.2\end{bmatrix}$
$\begin{bmatrix}-0.93 & 5.6 & 7.76\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

643. Ray R has starting point e=$\begin{bmatrix}-22.46 & -2.15 & -2.8\end{bmatrix}$
and direction d=$\begin{bmatrix}0.75 & -0.3 & 0.6\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-0.12 & -2.51 & -6.94\end{bmatrix}$
$\begin{bmatrix}-1.33 & -4.21 & -0.15\end{bmatrix}$
$\begin{bmatrix}-6.67 & -2.76 & -5.97\end{bmatrix}$
$\begin{bmatrix}-7.88 & -3.73 & -2.09\end{bmatrix}$
$\begin{bmatrix}-1.57 & -2.76 & -5.97\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

644. Ray R has starting point e=$\begin{bmatrix}-1.78 & -2.08 & -4.83\end{bmatrix}$
and direction d=$\begin{bmatrix}0.82 & -0.41 & 0.41\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}0.41 & -1.46 & -6.41\end{bmatrix}$
$\begin{bmatrix}-4.54 & -1.46 & -1.46\end{bmatrix}$
$\begin{bmatrix}-4.54 & -5.71 & -1.46\end{bmatrix}$
$\begin{bmatrix}-4.54 & -3.59 & -1.46\end{bmatrix}$
$\begin{bmatrix}-1.0 & -3.59 & -5.0\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

645. Ray R has starting point e=$\begin{bmatrix}-7.99 & 4.8 & 0.51\end{bmatrix}$
and direction d=$\begin{bmatrix}0.82 & -0.41 & 0.41\end{bmatrix}$

. Polygon P has vertices $\begin{bmatrix}-0.08 & 7.62 & -0.46\end{bmatrix}$
$\begin{bmatrix}6.46 & 6.46 & -2.0\end{bmatrix}$
$\begin{bmatrix}1.27 & 4.15 & -1.42\end{bmatrix}$
$\begin{bmatrix}0.69 & 6.46 & -0.85\end{bmatrix}$
$\begin{bmatrix}-1.62 & 2.23 & -1.23\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

646. Ray R has starting point e=$\begin{bmatrix}-12.52 & -2.99 & 2.37\end{bmatrix}$
and direction d=$\begin{bmatrix}0.32 & 0.81 & -0.49\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-5.0 & -1.0 & -4.03\end{bmatrix}$
$\begin{bmatrix}-6.94 & -0.51 & -1.85\end{bmatrix}$
$\begin{bmatrix}-3.06 & -1.49 & -7.18\end{bmatrix}$
$\begin{bmatrix}-5.0 & -1.0 & -6.94\end{bmatrix}$
$\begin{bmatrix}-1.12 & -1.97 & -7.43\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

647. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 1) in a 333 x 572 image with the following parameters? l=-2, r=-1, b=2, t=4 view type = orthographic
camera origin = $\begin{bmatrix}-5.0 & -4.0 & -5.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.0 & 0.89 & 0.45\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.78 & -0.2 & 0.59\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.85 & -0.51 & -0.17\end{bmatrix}$

648. Ray R has starting point e=$\begin{bmatrix}-4.23 & 4.05 & -5.91\end{bmatrix}$
and direction d=$\begin{bmatrix}0.53 & -0.8 & 0.27\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-8.88 & 8.09 & -4.03\end{bmatrix}$
$\begin{bmatrix}-1.12 & 0.82 & -5.97\end{bmatrix}$
$\begin{bmatrix}-5.0 & -1.12 & -5.0\end{bmatrix}$
$\begin{bmatrix}-5.0 & 1.3 & -5.0\end{bmatrix}$
$\begin{bmatrix}-6.94 & 0.57 & -4.51\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

649. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 1) in a 627

x 433 image with the following parameters? l=-5, r=1, b=-3, t=0 view type = perspective
camera origin = $\begin{bmatrix}-2.0 & 3.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.8 & -0.6 & 0.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.51 & -0.69 & 0.51\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.49 & -0.73 & 0.49\end{bmatrix}$
image plane at distance 2 in front of viewpoint

650. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 0) in a 591 x 373 image with the following parameters? l=-5, r=-4, b=-4, t=3 view type = orthographic
camera origin = $\begin{bmatrix}-1.0 & 4.0 & 0.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.77 & 0.62 & -0.15\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & 0.0 & -1.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.86 & 0.51 & 0.0\end{bmatrix}$

651. Ray R has starting point e=$\begin{bmatrix}-1.87 & -3.45 & 0.72\end{bmatrix}$
and direction d=$\begin{bmatrix}0.82 & -0.41 & 0.41\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}1.77 & -1.43 & 1.2\end{bmatrix}$
$\begin{bmatrix}3.83 & -5.03 & -1.54\end{bmatrix}$
$\begin{bmatrix}4.17 & -2.46 & 2.23\end{bmatrix}$
$\begin{bmatrix}8.63 & -4.0 & 4.63\end{bmatrix}$
$\begin{bmatrix}4.51 & -7.6 & -4.29\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

652. Ray R has starting point e=$\begin{bmatrix}-9.54 & -4.92 & 1.0\end{bmatrix}$
and direction d=$\begin{bmatrix}0.71 & 0.71 & -0.0\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-1.82 & -0.51 & -5.86\end{bmatrix}$
$\begin{bmatrix}-0.18 & -8.67 & -0.96\end{bmatrix}$
$\begin{bmatrix}-3.04 & -3.78 & -0.14\end{bmatrix}$
$\begin{bmatrix}-1.0 & -5.0 & -3.0\end{bmatrix}$
$\begin{bmatrix}-3.04 & -3.37 & -0.55\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

653. Ray R has starting point e=$\begin{bmatrix}2.48 & 10.0 & 3.14\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.62 & -0.47 & -0.62\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}0.78 & 7.49 & 0.63\end{bmatrix}$
$\begin{bmatrix}2.41 & 8.31 & 1.86\end{bmatrix}$
$\begin{bmatrix}-3.31 & 7.49 & -1.41\end{bmatrix}$
$\begin{bmatrix}6.08 & 3.82 & 1.45\end{bmatrix}$

$\begin{bmatrix}3.63 & 3.0 & -0.18\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

654. Ray R has starting point e=$\begin{bmatrix}-5.88 & -4.31 & 0.04\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.41 & 0.82 & 0.41\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}0.86 & -0.96 & 1.89\end{bmatrix}$ $\begin{bmatrix}0.11 & -1.33 & 2.63\end{bmatrix}$ $\begin{bmatrix}-2.67 & -0.77 & 6.71\end{bmatrix}$ $\begin{bmatrix}-3.97 & -5.6 & 5.23\end{bmatrix}$ $\begin{bmatrix}-3.79 & -3.56 & 6.34\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

655. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 3) in a 304 x 258 image with the following parameters? l=-1, r=0, b=-4, t=-2 view type = perspective camera origin = $\begin{bmatrix}4.0 & 3.0 & 0.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.44 & 0.87 & 0.22\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.74 & 0.37 & 0.56\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.19 & -0.19 & -0.96\end{bmatrix}$ image plane at distance 0 in front of viewpoint

656. Ray R has starting point e=$\begin{bmatrix}-15.12 & -0.75 & 1.92\end{bmatrix}$ and direction d=$\begin{bmatrix}0.85 & 0.51 & -0.17\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}1.73 & -0.73 & 3.0\end{bmatrix}$ $\begin{bmatrix}-1.15 & -0.15 & 5.31\end{bmatrix}$ $\begin{bmatrix}-0.58 & 0.42 & 4.15\end{bmatrix}$ $\begin{bmatrix}2.89 & -0.15 & 1.27\end{bmatrix}$ $\begin{bmatrix}-1.15 & 2.15 & 3.0\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

657. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 2) in a 671 x 730 image with the following parameters? l=0, r=2, b=-1, t=1 view type = perspective camera origin = $\begin{bmatrix}0.0 & 3.0 & 4.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.37 & 0.0 & -0.93\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.24 & 0.97 & 0.0\end{bmatrix}$

camera w axis = $\begin{bmatrix}-0.53 & 0.27 & 0.8\end{bmatrix}$
image plane at distance 4 in front of viewpoint

658. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 4) in a 502 x 601 image with the following parameters? l=-4, r=-3, b=-2, t=3 view type = orthographic
camera origin = $\begin{bmatrix}-1.0 & 2.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.45 & 0.89 & 0.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.32 & 0.0 & 0.95\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.78 & -0.62 & 0.0\end{bmatrix}$

659. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 1) in a 378 x 294 image with the following parameters? l=-2, r=4, b=-5, t=-3 view type = orthographic
camera origin = $\begin{bmatrix}-2.0 & -2.0 & -5.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.2 & 0.59 & -0.78\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.56 & -0.37 & -0.74\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.8 & -0.6 & 0.0\end{bmatrix}$

660. Ray R has starting point e=$\begin{bmatrix}-0.67 & 0.8 & 3.61\end{bmatrix}$
and direction d=$\begin{bmatrix}0.45 & -0.89 & -0.0\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}1.78 & 1.62 & 5.12\end{bmatrix}$
$\begin{bmatrix}-2.9 & -2.12 & 9.03\end{bmatrix}$
$\begin{bmatrix}-2.12 & -1.5 & -1.44\end{bmatrix}$
$\begin{bmatrix}3.34 & 2.87 & 6.69\end{bmatrix}$
$\begin{bmatrix}1.0 & 1.0 & 0.91\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

661. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 4) in a 275 x 329 image with the following parameters? l=0, r=3, b=-5, t=4 view type = perspective
camera origin = $\begin{bmatrix}0.0 & -2.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.71 & -0.71 & 0.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.53 & -0.66 & 0.53\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.55 & 0.83 & 0.0\end{bmatrix}$
image plane at distance 2 in front of viewpoint

662. Ray R has starting point e=$\begin{bmatrix}-13.26 & -3.61 & -0.66\end{bmatrix}$
and direction d=$\begin{bmatrix}0.3 & -0.3 & 0.9\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-0.57 & -11.06 & 1.57\end{bmatrix}$
$\begin{bmatrix}-4.94 & -5.49 & 0.6\end{bmatrix}$
$\begin{bmatrix}-2.03 & -1.36 & 9.09\end{bmatrix}$
$\begin{bmatrix}-2.51 & -7.67 & 2.06\end{bmatrix}$
$\begin{bmatrix}-3.0 & -0.63 & 8.37\end{bmatrix}$
.
b) What is the normal to P?

c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

663. Ray R has starting point e=$\begin{bmatrix}-2.99 & 1.8 & 1.72\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.41 & 0.41 & -0.82\end{bmatrix}$ . Polygon P has vertices $\begin{bmatrix}4.9 & 4.84 & 6.12\end{bmatrix}$ $\begin{bmatrix}-0.56 & 0.16 & 1.75\end{bmatrix}$ $\begin{bmatrix}4.12 & 3.59 & 5.5\end{bmatrix}$ $\begin{bmatrix}3.34 & -1.72 & 4.87\end{bmatrix}$ $\begin{bmatrix}4.9 & 1.87 & 6.12\end{bmatrix}$ .
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

664. Ray R has starting point e=$\begin{bmatrix}-0.08 & 4.58 & -3.32\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.0 & 0.83 & -0.55\end{bmatrix}$ . Polygon P has vertices $\begin{bmatrix}2.47 & 8.02 & -1.81\end{bmatrix}$ $\begin{bmatrix}-0.27 & 4.37 & -3.63\end{bmatrix}$ $\begin{bmatrix}-0.45 & 6.56 & -3.27\end{bmatrix}$ $\begin{bmatrix}-3.74 & 4.0 & -5.1\end{bmatrix}$ $\begin{bmatrix}-1.37 & 1.08 & -4.73\end{bmatrix}$ .
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

665. Ray R has starting point e=$\begin{bmatrix}-0.28 & 3.14 & -2.13\end{bmatrix}$ and direction d=$\begin{bmatrix}0.24 & 0.97 & -0.0\end{bmatrix}$ . Polygon P has vertices $\begin{bmatrix}0.75 & 3.12 & -3.41\end{bmatrix}$ $\begin{bmatrix}-4.09 & 1.87 & 0.5\end{bmatrix}$ $\begin{bmatrix}-1.13 & 4.37 & -0.59\end{bmatrix}$ $\begin{bmatrix}-2.69 & 3.75 & 0.5\end{bmatrix}$ $\begin{bmatrix}-1.75 & 0.62 & -2.78\end{bmatrix}$ .
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

666. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 3) in a 451 x 736 image with the following parameters? l=-4, r=0, b=0, t=4 view type = perspective

camera origin = $\begin{bmatrix}-3.0 & -1.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.49 & -0.49 & 0.73\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.2 & -0.98 & 0.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.0 & -0.83 & -0.55\end{bmatrix}$
image plane at distance 4 in front of viewpoint

667. Ray R has starting point e=$\begin{bmatrix}-8.42 & -0.16 & 2.2\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.58 & 0.58 & -0.58\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}1.31 & -1.5 & -3.19\end{bmatrix}$
$\begin{bmatrix}1.0 & -0.25 & -1.94\end{bmatrix}$
$\begin{bmatrix}0.53 & 3.5 & 1.34\end{bmatrix}$
$\begin{bmatrix}-0.87 & -3.37 & -2.41\end{bmatrix}$
$\begin{bmatrix}-1.5 & -0.87 & 0.09\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

668. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 2) in a 426 x 550 image with the following parameters? l=1, r=2, b=-5, t=4 view type = orthographic
camera origin = $\begin{bmatrix}4.0 & 3.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.2 & 0.0 & -0.98\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.81 & 0.49 & 0.32\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.32 & 0.95 & 0.0\end{bmatrix}$

669. Ray R has starting point e=$\begin{bmatrix}-10.21 & -6.5 & -2.52\end{bmatrix}$
and direction d=$\begin{bmatrix}0.62 & 0.62 & 0.49\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}5.92 & 0.92 & -4.64\end{bmatrix}$
$\begin{bmatrix}1.65 & -1.0 & -1.65\end{bmatrix}$
$\begin{bmatrix}0.8 & -2.92 & -2.08\end{bmatrix}$
$\begin{bmatrix}1.44 & -2.28 & -2.29\end{bmatrix}$
$\begin{bmatrix}0.38 & -3.56 & -2.08\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

670. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 4) in a 308 x 285 image with the following parameters? l=-2, r=4, b=-5, t=2 view type = perspective
camera origin = $\begin{bmatrix}4.0 & -2.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.71 & 0.71 & 0.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.69 & 0.69 & 0.23\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.0 & 0.55 & 0.83\end{bmatrix}$
image plane at distance 3 in front of viewpoint

671. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 4) in a 513 x 368 image with the following parameters? l=-3, r=0, b=-1, t=0 view type = orthographic camera origin = $\begin{bmatrix}-1.0 & -4.0 & -5.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.67 & -0.67 & -0.33\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.53 & -0.66 & -0.53\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.69 & 0.23 & -0.69\end{bmatrix}$

672. Ray R has starting point e=$\begin{bmatrix}-5.73 & -0.86 & -2.83\end{bmatrix}$
and direction d=$\begin{bmatrix}0.56 & 0.37 & 0.74\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}3.66 & -2.35 & 3.37\end{bmatrix}$
$\begin{bmatrix}3.49 & -0.15 & -4.07\end{bmatrix}$
$\begin{bmatrix}3.15 & -1.0 & -3.23\end{bmatrix}$
$\begin{bmatrix}5.86 & 2.38 & 0.15\end{bmatrix}$
$\begin{bmatrix}5.35 & 0.35 & 3.7\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

673. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 2) in a 390 x 741 image with the following parameters? l=-4, r=2, b=-4, t=-3 view type = orthographic camera origin = $\begin{bmatrix}1.0 & -4.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.19 & -0.19 & -0.96\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.37 & -0.74 & 0.56\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.0 & -0.51 & -0.86\end{bmatrix}$

674. Ray R has starting point e=$\begin{bmatrix}-9.23 & -5.7 & 4.85\end{bmatrix}$
and direction d=$\begin{bmatrix}0.47 & 0.62 & -0.62\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-0.6 & -2.6 & 7.17\end{bmatrix}$
$\begin{bmatrix}0.18 & -0.65 & 5.21\end{bmatrix}$
$\begin{bmatrix}3.43 & 3.91 & -0.78\end{bmatrix}$
$\begin{bmatrix}3.69 & -0.65 & 1.7\end{bmatrix}$
$\begin{bmatrix}3.04 & 1.95 & 0.79\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

675. Ray R has starting point e=$\begin{bmatrix}-4.58 & -4.78 & 1.41\end{bmatrix}$
and direction d=$\begin{bmatrix}0.67 & 0.67 & -0.33\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}1.98 & -3.78 & -1.63\end{bmatrix}$
$\begin{bmatrix}1.2 & -3.98 & -1.63\end{bmatrix}$
$\begin{bmatrix}-0.18 & -1.23 & -5.75\end{bmatrix}$

$\begin{bmatrix}6.49 & -3.98 & 0.14\end{bmatrix}$
$\begin{bmatrix}0.41 & -5.94 & 0.73\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

676. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 2) in a 412 x 693 image with the following parameters? l=-1, r=2, b=1, t=3 view type = perspective camera origin = $\begin{bmatrix}-4.0 & -1.0 & 2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.98 & -0.2 & 0.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.44 & 0.87 & 0.22\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.35 & -0.87 & -0.35\end{bmatrix}$
image plane at distance 2 in front of viewpoint

677. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 1) in a 251 x 419 image with the following parameters? l=-2, r=1, b=-3, t=2 view type = perspective camera origin = $\begin{bmatrix}1.0 & 2.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.8 & -0.6 & 0.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.8 & 0.53 & 0.27\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.17 & 0.7 & 0.7\end{bmatrix}$
image plane at distance 0 in front of viewpoint

678. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 3) in a 544 x 269 image with the following parameters? l=-4, r=2, b=2, t=3 view type = orthographic camera origin = $\begin{bmatrix}0.0 & 3.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.69 & 0.23 & -0.69\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.41 & -0.41 & -0.82\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.41 & -0.41 & 0.82\end{bmatrix}$

679. Ray R has starting point e=$\begin{bmatrix}-9.11 & -6.49 & 1.0\end{bmatrix}$
and direction d=$\begin{bmatrix}0.62 & 0.78 & -0.0\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-7.02 & -5.21 & -1.6\end{bmatrix}$
$\begin{bmatrix}-3.7 & -3.4 & 0.51\end{bmatrix}$
$\begin{bmatrix}-0.68 & -1.89 & 2.02\end{bmatrix}$
$\begin{bmatrix}-4.6 & -5.51 & -4.92\end{bmatrix}$
$\begin{bmatrix}-7.32 & -6.11 & -4.02\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

680. Ray R has starting point e=$\begin{bmatrix}-1.81 & 2.41 & 0.56\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.44 & 0.87 & -0.22\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-1.86 & 0.53 & 0.73\end{bmatrix}$

$\begin{bmatrix}-3.47 & 4.53 & 0.47\end{bmatrix}$
$\begin{bmatrix}-1.59 & 4.8 & -0.87\end{bmatrix}$
$\begin{bmatrix}0.01 & 1.59 & -0.87\end{bmatrix}$
$\begin{bmatrix}-2.4 & 4.8 & -0.34\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

681. Ray R has starting point e=$\begin{bmatrix}3.09 & 3.79 & 1.06\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.33 & -0.67 & -0.67\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}2.35 & 1.65 & 3.95\end{bmatrix}$
$\begin{bmatrix}2.82 & 4.01 & -0.29\end{bmatrix}$
$\begin{bmatrix}2.82 & 2.12 & 1.59\end{bmatrix}$
$\begin{bmatrix}3.06 & 0.94 & 1.83\end{bmatrix}$
$\begin{bmatrix}2.82 & 4.48 & -0.76\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

682. Ray R has starting point e=$\begin{bmatrix}6.29 & -1.84 & 2.48\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.59 & 0.2 & 0.78\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}5.86 & -1.74 & 5.76\end{bmatrix}$
$\begin{bmatrix}3.07 & -0.63 & 1.11\end{bmatrix}$
$\begin{bmatrix}6.79 & -2.11 & -3.9\end{bmatrix}$
$\begin{bmatrix}6.79 & -2.11 & 5.01\end{bmatrix}$
$\begin{bmatrix}2.14 & -0.26 & -0.19\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

683. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 3) in a 459 x 592 image with the following parameters? l=-3, r=-2, b=3, t=4 view type = orthographic camera origin = $\begin{bmatrix}-4.0 & -2.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.58 & -0.58 & 0.58\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.95 & 0.32 & 0.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.0 & 0.71 & 0.71\end{bmatrix}$

684. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 2) in a 330 x 700 image with the following parameters? l=-3, r=-2, b=-2, t=-1 view type = perspective

camera origin = $\begin{bmatrix} 2.0 & -3.0 & 3.0 \end{bmatrix}$
camera u axis = $\begin{bmatrix} -0.67 & -0.67 & 0.33 \end{bmatrix}$
camera v axis = $\begin{bmatrix} 0.67 & 0.33 & -0.67 \end{bmatrix}$
camera w axis = $\begin{bmatrix} 0.64 & -0.64 & -0.43 \end{bmatrix}$
image plane at distance 0 in front of viewpoint

685. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 1) in a 472 x 654 image with the following parameters? l=0, r=4, b=-3, t=3 view type = perspective
camera origin = $\begin{bmatrix} -5.0 & -2.0 & 2.0 \end{bmatrix}$
camera u axis = $\begin{bmatrix} -0.64 & -0.64 & -0.43 \end{bmatrix}$
camera v axis = $\begin{bmatrix} 0.78 & 0.59 & 0.2 \end{bmatrix}$
camera w axis = $\begin{bmatrix} -0.85 & 0.17 & 0.51 \end{bmatrix}$
image plane at distance 1 in front of viewpoint

686. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 4) in a 389 x 445 image with the following parameters? l=3, r=4, b=-1, t=4 view type = orthographic
camera origin = $\begin{bmatrix} 0.0 & -2.0 & -2.0 \end{bmatrix}$
camera u axis = $\begin{bmatrix} 0.2 & -0.59 & -0.78 \end{bmatrix}$
camera v axis = $\begin{bmatrix} 0.57 & -0.71 & -0.42 \end{bmatrix}$
camera w axis = $\begin{bmatrix} 0.0 & 0.83 & -0.55 \end{bmatrix}$

687. Ray R has starting point e=$\begin{bmatrix} -8.0 & 4.83 & 3.48 \end{bmatrix}$
and direction d=$\begin{bmatrix} 0.77 & 0.15 & -0.62 \end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix} -3.7 & 3.03 & -4.76 \end{bmatrix}$
$\begin{bmatrix} -0.79 & 0.12 & -4.03 \end{bmatrix}$
$\begin{bmatrix} -2.97 & 5.94 & -5.49 \end{bmatrix}$
$\begin{bmatrix} -4.43 & -0.85 & -3.79 \end{bmatrix}$
$\begin{bmatrix} -2.97 & 0.12 & -4.03 \end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

688. Ray R has starting point e=$\begin{bmatrix} -15.25 & -0.09 & -0.86 \end{bmatrix}$
and direction d=$\begin{bmatrix} 0.37 & -0.74 & 0.56 \end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix} 0.14 & -8.73 & 4.94 \end{bmatrix}$
$\begin{bmatrix} -0.84 & -1.86 & 5.92 \end{bmatrix}$
$\begin{bmatrix} -5.55 & -0.1 & 0.23 \end{bmatrix}$
$\begin{bmatrix} -2.41 & -4.41 & 2.98 \end{bmatrix}$
$\begin{bmatrix} -0.45 & -1.67 & 6.51 \end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

689. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 2) in a 495 x 418 image with the following parameters? l=-1, r=4, b=-4, t=-2 view type = perspective
camera origin = $\begin{bmatrix}4.0 & -3.0 & -5.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.94 & -0.24 & -0.24\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.33 & 0.67 & -0.67\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.89 & 0.0 & 0.45\end{bmatrix}$
image plane at distance 2 in front of viewpoint

690. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 4) in a 514 x 608 image with the following parameters? l=3, r=4, b=0, t=1 view type = perspective
camera origin = $\begin{bmatrix}2.0 & -3.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.67 & -0.67 & 0.33\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.82 & -0.41 & -0.41\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.0 & -0.32 & -0.95\end{bmatrix}$
image plane at distance 2 in front of viewpoint

691. Ray R has starting point e=$\begin{bmatrix}-5.82 & -4.39 & 2.56\end{bmatrix}$
and direction d=$\begin{bmatrix}0.9 & -0.3 & 0.3\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-0.67 & -5.67 & -0.33\end{bmatrix}$
$\begin{bmatrix}-6.0 & -4.33 & 7.67\end{bmatrix}$
$\begin{bmatrix}-3.33 & -7.33 & 8.33\end{bmatrix}$
$\begin{bmatrix}-3.67 & -2.33 & -1.0\end{bmatrix}$
$\begin{bmatrix}-1.0 & -9.0 & 7.0\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

692. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 3) in a 325 x 270 image with the following parameters? l=-5, r=4, b=-5, t=-1 view type = orthographic
camera origin = $\begin{bmatrix}-5.0 & -5.0 & 4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.71 & -0.42 & 0.57\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.81 & 0.49 & 0.32\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.55 & 0.83 & 0.0\end{bmatrix}$

693. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 4) in a 324 x 527 image with the following parameters? l=-5, r=-1, b=-4, t=1 view type = perspective
camera origin = $\begin{bmatrix}2.0 & 1.0 & 2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.65 & 0.39 & -0.65\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.58 & -0.58 & 0.58\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.51 & -0.85 & 0.17\end{bmatrix}$
image plane at distance 1 in front of viewpoint

694. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 3) in a 720 x 407 image with the following parameters? l=-2, r=2, b=-4, t=1 view type = perspective
camera origin = $\begin{bmatrix}-4.0 & -5.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.89 & -0.45 & 0.0\end{bmatrix}$

camera v axis = $\begin{bmatrix}-0.41 & 0.82 & 0.41\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.73 & 0.49 & 0.49\end{bmatrix}$
image plane at distance 3 in front of viewpoint

695. Ray R has starting point e=$\begin{bmatrix}-14.07 & -4.89 & 1.18\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.74 & 0.56 & -0.37\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-1.29 & -2.4 & -2.9\end{bmatrix}$
$\begin{bmatrix}-7.32 & -2.4 & 3.13\end{bmatrix}$
$\begin{bmatrix}-7.62 & -3.0 & 1.62\end{bmatrix}$
$\begin{bmatrix}-7.62 & -4.81 & -3.81\end{bmatrix}$
$\begin{bmatrix}-8.82 & -4.51 & -1.7\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

696. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 1) in a 512 x 347 image with the following parameters? l=-3, r=-2, b=-1, t=2 view type = orthographic
camera origin = $\begin{bmatrix}-4.0 & -2.0 & 2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.8 & -0.27 & -0.53\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.33 & -0.67 & 0.67\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.35 & 0.35 & -0.87\end{bmatrix}$

697. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 3) in a 269 x 423 image with the following parameters? l=-5, r=4, b=0, t=1 view type = perspective
camera origin = $\begin{bmatrix}3.0 & -3.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.69 & -0.23 & -0.69\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.37 & 0.56 & -0.74\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.71 & 0.57 & -0.42\end{bmatrix}$
image plane at distance 2 in front of viewpoint

698. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 1) in a 712 x 320 image with the following parameters? l=-5, r=1, b=-3, t=4 view type = perspective
camera origin = $\begin{bmatrix}3.0 & 4.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.58 & 0.58 & -0.58\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.82 & 0.41 & -0.41\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.62 & 0.0 & -0.78\end{bmatrix}$
image plane at distance 3 in front of viewpoint

699. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 1) in a 533 x 633 image with the following parameters? l=-4, r=-2, b=-1, t=3 view type = orthographic
camera origin = $\begin{bmatrix}1.0 & -1.0 & 4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.53 & -0.27 & 0.8\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.67 & 0.67 & -0.33\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.64 & 0.43 & 0.64\end{bmatrix}$

700. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 2) in a 367 x 262 image with the following parameters? l=-5, r=0, b=-1, t=2 view type = perspective camera origin = $\begin{bmatrix}-3.0 & -3.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.62 & 0.15 & -0.77\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.7 & -0.14 & -0.7\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.6 & -0.75 & 0.3\end{bmatrix}$
image plane at distance 2 in front of viewpoint

701. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 4) in a 647 x 643 image with the following parameters? l=-4, r=0, b=-4, t=-3 view type = orthographic camera origin = $\begin{bmatrix}-2.0 & 4.0 & 2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.67 & -0.67 & 0.33\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.3 & 0.3 & -0.9\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.24 & -0.94 & -0.24\end{bmatrix}$

702. Ray R has starting point e=$\begin{bmatrix}2.25 & -7.94 & 2.87\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.45 & 0.89 & -0.0\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}6.24 & -7.68 & 2.66\end{bmatrix}$
$\begin{bmatrix}-2.71 & -7.68 & 2.66\end{bmatrix}$
$\begin{bmatrix}7.13 & -5.89 & 3.55\end{bmatrix}$
$\begin{bmatrix}7.58 & -6.79 & 3.11\end{bmatrix}$
$\begin{bmatrix}7.58 & -4.11 & 4.45\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

703. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 1) in a 455 x 367 image with the following parameters? l=1, r=2, b=3, t=4 view type = orthographic camera origin = $\begin{bmatrix}-4.0 & 3.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.69 & 0.23 & 0.69\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.58 & -0.58 & 0.58\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.37 & 0.56 & -0.74\end{bmatrix}$

704. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 3) in a 333 x 301 image with the following parameters? l=-4, r=0, b=-3, t=3 view type = perspective camera origin = $\begin{bmatrix}3.0 & 1.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.71 & 0.0 & 0.71\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.6 & -0.8 & 0.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.56 & -0.37 & -0.74\end{bmatrix}$
image plane at distance 4 in front of viewpoint

705. Ray R has starting point e=$\begin{bmatrix}-12.73 & 1.39 & 2.65\end{bmatrix}$
and direction d=$\begin{bmatrix}0.58 & -0.58 & -0.58\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-3.06 & -0.35 & -2.44\end{bmatrix}$
$\begin{bmatrix}-4.8 & -0.78 & -3.09\end{bmatrix}$

$\begin{bmatrix}0.44 & -3.84 & -3.31\end{bmatrix}$
$\begin{bmatrix}1.31 & -2.09 & -2.22\end{bmatrix}$
$\begin{bmatrix}-4.36 & 0.31 & -2.44\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

706. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 4) in a 503 x 726 image with the following parameters? l=-2, r=4, b=-4, t=-3 view type = orthographic camera origin = $\begin{bmatrix}0.0 & 0.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.0 & 0.71 & 0.71\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & 0.71 & -0.71\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.74 & 0.37 & 0.56\end{bmatrix}$

707. Ray R has starting point e=$\begin{bmatrix}1.26 & 2.16 & 0.9\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.3 & -0.3 & 0.9\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}1.59 & 1.41 & -0.24\end{bmatrix}$
$\begin{bmatrix}0.17 & 2.83 & 0.46\end{bmatrix}$
$\begin{bmatrix}0.17 & 2.83 & 7.54\end{bmatrix}$
$\begin{bmatrix}4.41 & -1.41 & 7.54\end{bmatrix}$
$\begin{bmatrix}4.41 & -1.41 & 2.59\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

708. Ray R has starting point e=$\begin{bmatrix}-6.03 & -2.48 & 2.01\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.0 & 0.45 & -0.89\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}1.62 & -0.36 & 3.22\end{bmatrix}$
$\begin{bmatrix}-3.18 & 1.38 & 1.25\end{bmatrix}$
$\begin{bmatrix}-2.75 & -2.11 & 0.6\end{bmatrix}$
$\begin{bmatrix}-3.4 & 0.07 & 0.82\end{bmatrix}$
$\begin{bmatrix}1.62 & 2.25 & 3.87\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

709. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 3) in a 440 x 559 image with the following parameters? l=-3, r=-2, b=1, t=3 view type = orthographic camera origin = $\begin{bmatrix}-5.0 & 2.0 & 2.0\end{bmatrix}$

camera u axis = $\begin{bmatrix}0.46 & -0.76 & 0.46\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.37 & 0.0 & -0.93\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.87 & -0.44 & 0.22\end{bmatrix}$

710. Ray R has starting point e=$\begin{bmatrix}-7.61 & -5.14 & -3.69\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.17 & 0.51 & 0.85\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-3.33 & -3.33 & 2.67\end{bmatrix}$
$\begin{bmatrix}-2.67 & -2.67 & 2.33\end{bmatrix}$
$\begin{bmatrix}-6.0 & -6.0 & 4.0\end{bmatrix}$
$\begin{bmatrix}-2.67 & -0.67 & 3.33\end{bmatrix}$
$\begin{bmatrix}0.67 & -4.67 & -2.0\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

711. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 4) in a 275 x 738 image with the following parameters? l=-5, r=-3, b=-4, t=-3 view type = orthographic
camera origin = $\begin{bmatrix}0.0 & 1.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.51 & -0.17 & -0.85\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.83 & -0.55 & 0.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.67 & -0.67 & 0.33\end{bmatrix}$

712. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 0) in a 574 x 358 image with the following parameters? l=-2, r=1, b=-1, t=1 view type = orthographic
camera origin = $\begin{bmatrix}2.0 & 2.0 & 4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.17 & -0.51 & -0.85\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.53 & -0.66 & -0.53\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.62 & -0.15 & -0.77\end{bmatrix}$

713. Ray R has starting point e=$\begin{bmatrix}5.12 & 3.41 & -8.99\end{bmatrix}$
and direction d=$\begin{bmatrix}0.74 & -0.56 & 0.37\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-0.0 & 2.74 & -3.35\end{bmatrix}$
$\begin{bmatrix}6.96 & -1.79 & 1.0\end{bmatrix}$
$\begin{bmatrix}9.22 & 1.0 & -8.22\end{bmatrix}$
$\begin{bmatrix}2.96 & 3.09 & -7.18\end{bmatrix}$
$\begin{bmatrix}7.83 & -1.44 & -0.74\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

714. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 1) in a 541 x 373 image with the following parameters? l=4, r=5, b=0, t=2 view type = orthographic
camera origin = $\begin{bmatrix}-5.0 & -3.0 & 4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.0 & -0.93 & 0.37\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.24 & -0.94 & -0.24\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.53 & -0.8 & 0.27\end{bmatrix}$

715. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 1) in a 534 x 733 image with the following parameters? l=1, r=2, b=-1, t=0 view type = perspective
camera origin = $\begin{bmatrix}0.0 & -4.0 & 4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.71 & 0.71 & 0.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.53 & -0.53 & -0.66\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.58 & -0.58 & -0.58\end{bmatrix}$
image plane at distance 4 in front of viewpoint

716. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 0) in a 602 x 436 image with the following parameters? l=-5, r=-4, b=-2, t=2 view type = perspective
camera origin = $\begin{bmatrix}-3.0 & -2.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.93 & 0.0 & 0.37\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.87 & -0.22 & 0.44\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.89 & 0.45 & 0.0\end{bmatrix}$
image plane at distance 1 in front of viewpoint

717. Ray R has starting point e=$\begin{bmatrix}-10.65 & -7.03 & -1.69\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.2 & 0.78 & 0.59\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}4.85 & -4.91 & -5.73\end{bmatrix}$
$\begin{bmatrix}-3.88 & -3.94 & -5.49\end{bmatrix}$
$\begin{bmatrix}-4.12 & -3.94 & -5.49\end{bmatrix}$
$\begin{bmatrix}4.61 & -3.94 & -5.49\end{bmatrix}$
$\begin{bmatrix}4.12 & -2.0 & -5.0\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

718. Ray R has starting point e=$\begin{bmatrix}-2.46 & -4.93 & -4.4\end{bmatrix}$
and direction d=$\begin{bmatrix}0.8 & -0.27 & -0.53\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}3.01 & -3.46 & -4.77\end{bmatrix}$
$\begin{bmatrix}-1.62 & -6.55 & -6.31\end{bmatrix}$
$\begin{bmatrix}0.54 & -5.62 & -6.01\end{bmatrix}$
$\begin{bmatrix}3.93 & -2.85 & -4.46\end{bmatrix}$
$\begin{bmatrix}2.08 & -0.99 & -2.61\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?

e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

719. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 3) in a 454 x 420 image with the following parameters? l=-4, r=-1, b=-4, t=-2 view type = perspective camera origin = $\begin{bmatrix}2.0 & -5.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.27 & -0.53 & 0.8\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & 0.97 & 0.24\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.3 & -0.6 & -0.75\end{bmatrix}$
image plane at distance 0 in front of viewpoint

720. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 1) in a 669 x 455 image with the following parameters? l=1, r=4, b=2, t=3 view type = orthographic camera origin = $\begin{bmatrix}-3.0 & -1.0 & -4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.33 & 0.67 & -0.67\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.47 & 0.62 & 0.62\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.22 & -0.87 & -0.44\end{bmatrix}$

721. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 4) in a 455 x 312 image with the following parameters? l=1, r=3, b=-1, t=3 view type = perspective camera origin = $\begin{bmatrix}3.0 & 0.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.78 & 0.59 & -0.2\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.87 & 0.44 & -0.22\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.8 & 0.53 & -0.27\end{bmatrix}$
image plane at distance 1 in front of viewpoint

722. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 3) in a 369 x 560 image with the following parameters? l=3, r=4, b=-5, t=-2 view type = perspective camera origin = $\begin{bmatrix}-1.0 & -3.0 & 2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.37 & 0.0 & -0.93\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.67 & 0.67 & -0.33\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.96 & -0.19 & 0.19\end{bmatrix}$
image plane at distance 3 in front of viewpoint

723. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 2) in a 734 x 615 image with the following parameters? l=-5, r=4, b=-3, t=-2 view type = perspective camera origin = $\begin{bmatrix}-1.0 & -3.0 & -5.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.71 & -0.71 & 0.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.86 & -0.51 & 0.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.69 & 0.23 & 0.69\end{bmatrix}$
image plane at distance 2 in front of viewpoint

724. Ray R has starting point e=$\begin{bmatrix}-4.4 & -5.16 & -0.94\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.33 & -0.67 & -0.67\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-2.7 & -1.21 & -5.61\end{bmatrix}$
$\begin{bmatrix}-5.48 & -6.09 & -0.04\end{bmatrix}$
$\begin{bmatrix}-2.0 & -6.26 & -0.74\end{bmatrix}$
$\begin{bmatrix}-2.7 & -4.17 & -2.65\end{bmatrix}$
$\begin{bmatrix}0.79 & -3.13 & -4.57\end{bmatrix}$

.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

725. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 1) in a 742 x 575 image with the following parameters? l=2, r=4, b=-3, t=-2 view type = perspective
camera origin = $\begin{bmatrix}2.0 & -5.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.73 & -0.49 & -0.49\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.32 & 0.0 & -0.95\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.0 & -0.86 & -0.51\end{bmatrix}$
image plane at distance 2 in front of viewpoint

726. Ray R has starting point e=$\begin{bmatrix}-12.07 & -5.62 & 0.99\end{bmatrix}$
and direction d=$\begin{bmatrix}0.85 & -0.51 & 0.17\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}0.46 & -5.92 & 4.89\end{bmatrix}$
$\begin{bmatrix}0.14 & -4.62 & 2.95\end{bmatrix}$
$\begin{bmatrix}-4.89 & -3.49 & 4.41\end{bmatrix}$
$\begin{bmatrix}3.22 & -2.84 & -2.08\end{bmatrix}$
$\begin{bmatrix}0.46 & -5.43 & 4.08\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

727. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 2) in a 319 x 288 image with the following parameters? l=-4, r=3, b=-1, t=2 view type = perspective
camera origin = $\begin{bmatrix}0.0 & -3.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.75 & 0.3 & -0.6\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.14 & -0.7 & -0.7\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.24 & -0.24 & 0.94\end{bmatrix}$
image plane at distance 3 in front of viewpoint

728. Ray R has starting point e=$\begin{bmatrix}-4.23 & -3.47 & -0.18\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.67 & 0.67 & 0.33\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-0.83 & -1.55 & -1.61\end{bmatrix}$
$\begin{bmatrix}0.0 & -1.0 & 3.66\end{bmatrix}$
$\begin{bmatrix}0.0 & -1.0 & 0.89\end{bmatrix}$
$\begin{bmatrix}-0.83 & -1.55 & 7.55\end{bmatrix}$
$\begin{bmatrix}0.0 & -1.0 & 4.77\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?

f) Is the intersection point in front of the viewpoint e?

729. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 4) in a 529 x 621 image with the following parameters? l=1, r=4, b=-2, t=-1 view type = perspective
camera origin = $\begin{bmatrix}-3.0 & 2.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.15 & 0.62 & -0.77\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.53 & 0.8 & 0.27\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.35 & -0.87 & -0.35\end{bmatrix}$
image plane at distance 1 in front of viewpoint

730. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 2) in a 491 x 313 image with the following parameters? l=-1, r=0, b=-1, t=0 view type = perspective
camera origin = $\begin{bmatrix}1.0 & 0.0 & -5.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.66 & -0.53 & 0.53\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & -0.98 & 0.2\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.95 & 0.0 & 0.32\end{bmatrix}$
image plane at distance 3 in front of viewpoint

731. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 2) in a 641 x 427 image with the following parameters? l=-5, r=-2, b=-5, t=3 view type = perspective
camera origin = $\begin{bmatrix}-2.0 & -4.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.33 & 0.67 & 0.67\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.59 & -0.2 & 0.78\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.7 & 0.7 & -0.17\end{bmatrix}$
image plane at distance 2 in front of viewpoint

732. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 1) in a 697 x 542 image with the following parameters? l=2, r=3, b=-2, t=3 view type = orthographic
camera origin = $\begin{bmatrix}3.0 & -1.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.19 & -0.96 & 0.19\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.65 & 0.39 & -0.65\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.67 & -0.33 & 0.67\end{bmatrix}$

733. Ray R has starting point e=$\begin{bmatrix}-5.8 & -0.81 & 7.27\end{bmatrix}$
and direction d=$\begin{bmatrix}0.98 & 0.2 & -0.0\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}4.36 & 5.12 & 1.88\end{bmatrix}$
$\begin{bmatrix}-3.41 & -0.54 & 7.54\end{bmatrix}$
$\begin{bmatrix}-2.0 & 1.59 & 5.41\end{bmatrix}$
$\begin{bmatrix}-2.0 & 5.12 & 1.88\end{bmatrix}$
$\begin{bmatrix}-2.71 & 3.71 & 3.29\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

734. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 3) in a 673 x 289 image with the following parameters? l=1, r=2, b=-4, t=0 view type = perspective

camera origin = $\begin{bmatrix}4.0 & -5.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.22 & -0.87 & -0.44\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.67 & 0.33 & 0.67\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.56 & 0.74 & 0.37\end{bmatrix}$
image plane at distance 2 in front of viewpoint

735. Ray R has starting point e=$\begin{bmatrix}3.3 & -2.81 & 0.54\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.56 & 0.74 & -0.37\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}4.16 & -2.7 & 0.85\end{bmatrix}$
$\begin{bmatrix}-1.09 & 2.55 & -4.4\end{bmatrix}$
$\begin{bmatrix}0.61 & -0.54 & 4.24\end{bmatrix}$
$\begin{bmatrix}3.08 & -2.54 & 4.39\end{bmatrix}$
$\begin{bmatrix}3.08 & -2.54 & 4.39\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

736. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 1) in a 745 x 429 image with the following parameters? l=-2, r=4, b=-1, t=4 view type = orthographic
camera origin = $\begin{bmatrix}4.0 & 2.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.41 & 0.82 & -0.41\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.0 & -0.6 & -0.8\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.62 & 0.62 & -0.47\end{bmatrix}$

737. Ray R has starting point e=$\begin{bmatrix}-9.67 & -5.55 & -1.25\end{bmatrix}$
and direction d=$\begin{bmatrix}0.45 & -0.0 & 0.89\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-1.86 & -6.35 & -0.77\end{bmatrix}$
$\begin{bmatrix}-7.16 & -5.37 & 2.96\end{bmatrix}$
$\begin{bmatrix}-7.55 & -3.41 & 2.77\end{bmatrix}$
$\begin{bmatrix}-8.14 & -8.71 & 4.53\end{bmatrix}$
$\begin{bmatrix}-5.98 & -6.55 & 2.37\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

738. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 0) in a 351 x 481 image with the following parameters? l=-4, r=1, b=1, t=4 view type = perspective
camera origin = $\begin{bmatrix}2.0 & 0.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.24 & 0.97 & 0.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.3 & -0.9 & -0.3\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.41 & -0.41 & 0.82\end{bmatrix}$
image plane at distance 4 in front of viewpoint

739. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 2) in a 446 x 463 image with the following parameters? l=-4, r=1, b=0, t=1 view type = orthographic
camera origin = $\begin{bmatrix}2.0 & 2.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.45 & 0.0 & -0.89\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.87 & 0.22 & 0.44\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.0 & 0.8 & -0.6\end{bmatrix}$

740. Ray R has starting point e=$\begin{bmatrix}-6.7 & -4.72 & 0.59\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.59 & 0.78 & 0.2\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-1.42 & -4.89 & -6.92\end{bmatrix}$
$\begin{bmatrix}-4.4 & 1.37 & -0.06\end{bmatrix}$
$\begin{bmatrix}-2.91 & -2.06 & -3.64\end{bmatrix}$
$\begin{bmatrix}-3.81 & -2.81 & -2.89\end{bmatrix}$
$\begin{bmatrix}-4.11 & -7.13 & -4.68\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

741. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 2) in a 296 x 639 image with the following parameters? l=-2, r=-1, b=-2, t=-1 view type = perspective
camera origin = $\begin{bmatrix}3.0 & -2.0 & 4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.51 & -0.85 & -0.17\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.69 & 0.69 & -0.23\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.78 & -0.2 & -0.59\end{bmatrix}$
image plane at distance 4 in front of viewpoint

742. Ray R has starting point e=$\begin{bmatrix}-3.86 & 2.28 & 1.13\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.0 & -0.97 & -0.24\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}3.32 & 1.82 & 2.83\end{bmatrix}$
$\begin{bmatrix}6.03 & 4.86 & -1.56\end{bmatrix}$
$\begin{bmatrix}5.86 & 7.06 & 5.87\end{bmatrix}$
$\begin{bmatrix}4.85 & 4.18 & 2.32\end{bmatrix}$
$\begin{bmatrix}3.32 & 0.13 & -2.24\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

743. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 3) in a 579 x 474 image with the following parameters? l=-4, r=-3, b=-1, t=1 view type = perspective
camera origin = $\begin{bmatrix}2.0 & 2.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.24 & -0.97 & 0.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.56 & -0.74 & 0.37\end{bmatrix}$

camera w axis = $\begin{bmatrix}-0.3 & -0.3 & -0.9\end{bmatrix}$
image plane at distance 4 in front of viewpoint

744. Ray R has starting point e=$\begin{bmatrix}-3.32 & 0.55 & 1.56\end{bmatrix}$
and direction d=$\begin{bmatrix}0.3 & -0.6 & 0.75\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-5.77 & 0.61 & 0.96\end{bmatrix}$
$\begin{bmatrix}-2.82 & 0.41 & 1.94\end{bmatrix}$
$\begin{bmatrix}-7.33 & 1.0 & -1.0\end{bmatrix}$
$\begin{bmatrix}-8.9 & 1.0 & -1.0\end{bmatrix}$
$\begin{bmatrix}-5.37 & 1.78 & -4.92\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

745. Ray R has starting point e=$\begin{bmatrix}-6.23 & 4.3 & -4.19\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.24 & -0.24 & 0.94\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-6.83 & 3.83 & -3.54\end{bmatrix}$
$\begin{bmatrix}-1.88 & -1.12 & -1.41\end{bmatrix}$
$\begin{bmatrix}-7.54 & 4.54 & 2.12\end{bmatrix}$
$\begin{bmatrix}-6.12 & 3.12 & -2.12\end{bmatrix}$
$\begin{bmatrix}-7.54 & 4.54 & 0.0\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

746. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 2) in a 296 x 503 image with the following parameters? l=-3, r=2, b=-1, t=2 view type = orthographic
camera origin = $\begin{bmatrix}4.0 & -4.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.23 & 0.69 & -0.69\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.62 & -0.62 & -0.47\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.58 & -0.58 & 0.58\end{bmatrix}$

747. Ray R has starting point e=$\begin{bmatrix}2.55 & 0.97 & -0.45\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.58 & 0.58 & -0.58\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-1.43 & 0.94 & -2.14\end{bmatrix}$
$\begin{bmatrix}0.29 & 1.97 & 0.6\end{bmatrix}$
$\begin{bmatrix}4.57 & 4.54 & -2.66\end{bmatrix}$
$\begin{bmatrix}-2.29 & 0.43 & -1.46\end{bmatrix}$
$\begin{bmatrix}-0.57 & 1.46 & -1.11\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?

d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

748. Ray R has starting point e=$\begin{bmatrix}-8.48 & 1.57 & 1.0\end{bmatrix}$ and direction d=$\begin{bmatrix}1.0 & -0.0 & -0.0\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-0.04 & 2.26 & -4.23\end{bmatrix}$ $\begin{bmatrix}4.23 & 5.23 & -0.51\end{bmatrix}$ $\begin{bmatrix}2.74 & 6.16 & -3.11\end{bmatrix}$ $\begin{bmatrix}-0.97 & -3.5 & -1.63\end{bmatrix}$ $\begin{bmatrix}1.63 & -1.64 & 0.6\end{bmatrix}$.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

749. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 2) in a 390 x 728 image with the following parameters? l=-5, r=3, b=-4, t=-3 view type = orthographic
camera origin = $\begin{bmatrix}-1.0 & -2.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.59 & -0.78 & -0.2\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.71 & -0.71 & 0.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.56 & 0.37 & -0.74\end{bmatrix}$

750. Ray R has starting point e=$\begin{bmatrix}-6.58 & -5.69 & 2.53\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.35 & 0.87 & -0.35\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-4.62 & -1.04 & -5.62\end{bmatrix}$ $\begin{bmatrix}-0.91 & -4.09 & -0.82\end{bmatrix}$ $\begin{bmatrix}1.93 & -4.09 & -6.49\end{bmatrix}$ $\begin{bmatrix}0.84 & -3.44 & -6.93\end{bmatrix}$ $\begin{bmatrix}-0.47 & -3.0 & -6.06\end{bmatrix}$.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

751. Ray R has starting point e=$\begin{bmatrix}-8.61 & -3.87 & 1.23\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.41 & 0.82 & -0.41\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}4.27 & -4.06 & 3.4\end{bmatrix}$ $\begin{bmatrix}2.53 & 0.31 & 1.44\end{bmatrix}$ $\begin{bmatrix}1.0 & 0.75 & 0.56\end{bmatrix}$ $\begin{bmatrix}-1.62 & -3.62 & 0.35\end{bmatrix}$ $\begin{bmatrix}1.22 & -4.06 & 1.87\end{bmatrix}$.
b) What is the normal to P?

c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

752. Ray R has starting point e=$\begin{bmatrix}-16.5 & 2.72 & 1.17\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.49 & -0.49 & -0.73\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-7.4 & -0.2 & -0.6\end{bmatrix}$
$\begin{bmatrix}-4.4 & 3.8 & -1.0\end{bmatrix}$
$\begin{bmatrix}-7.4 & -0.2 & -4.6\end{bmatrix}$
$\begin{bmatrix}-5.0 & 3.0 & -3.6\end{bmatrix}$
$\begin{bmatrix}-4.4 & 3.8 & -2.8\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

753. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 2) in a 685 x 711 image with the following parameters? l=2, r=4, b=-1, t=3 view type = orthographic
camera origin = $\begin{bmatrix}-2.0 & -5.0 & 0.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.77 & 0.15 & -0.62\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.51 & -0.17 & -0.85\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.17 & -0.85 & -0.51\end{bmatrix}$

754. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 0) in a 528 x 458 image with the following parameters? l=2, r=3, b=-2, t=0 view type = perspective
camera origin = $\begin{bmatrix}-1.0 & -2.0 & 4.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.0 & 0.24 & -0.97\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.67 & -0.67 & 0.33\end{bmatrix}$
camera w axis = $\begin{bmatrix}-1.0 & 0.0 & 0.0\end{bmatrix}$
image plane at distance 1 in front of viewpoint

755. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 3) in a 406 x 507 image with the following parameters? l=-2, r=2, b=-3, t=-2 view type = orthographic
camera origin = $\begin{bmatrix}-4.0 & 1.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.32 & 0.49 & -0.81\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.51 & -0.69 & -0.51\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.2 & -0.59 & -0.78\end{bmatrix}$

756. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 0) in a 502 x 275 image with the following parameters? l=-3, r=-2, b=4, t=5 view type = orthographic
camera origin = $\begin{bmatrix}1.0 & 3.0 & -5.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.32 & 0.95 & 0.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.44 & 0.87 & -0.22\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.71 & 0.0 & 0.71\end{bmatrix}$

757. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 0) in a 740 x 284 image with the following parameters? l=-3, r=4, b=-5, t=-4 view type = orthographic
camera origin = $\begin{bmatrix}2.0 & -2.0 & 2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.87 & -0.22 & 0.44\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.43 & -0.64 & -0.64\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.0 & 0.51 & -0.86\end{bmatrix}$

758. Ray R has starting point e=$\begin{bmatrix}-15.3 & -3.88 & 3.88\end{bmatrix}$
and direction d=$\begin{bmatrix}0.43 & 0.64 & -0.64\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-1.31 & 0.89 & -5.58\end{bmatrix}$
$\begin{bmatrix}-3.62 & 0.31 & -2.69\end{bmatrix}$
$\begin{bmatrix}2.15 & -2.0 & -6.15\end{bmatrix}$
$\begin{bmatrix}3.89 & -2.0 & -7.89\end{bmatrix}$
$\begin{bmatrix}-1.31 & -4.31 & -0.38\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

759. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 1) in a 612 x 282 image with the following parameters? l=-1, r=0, b=0, t=4 view type = perspective
camera origin = $\begin{bmatrix}1.0 & -4.0 & 1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.53 & 0.53 & -0.66\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.81 & -0.32 & 0.49\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.33 & -0.67 & 0.67\end{bmatrix}$
image plane at distance 1 in front of viewpoint

760. Ray R has starting point e=$\begin{bmatrix}-10.29 & -0.15 & 3.77\end{bmatrix}$
and direction d=$\begin{bmatrix}0.76 & -0.46 & -0.46\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-1.39 & -2.81 & 1.21\end{bmatrix}$
$\begin{bmatrix}-0.49 & -4.3 & -0.73\end{bmatrix}$
$\begin{bmatrix}-4.22 & 0.17 & 3.0\end{bmatrix}$
$\begin{bmatrix}4.13 & -5.79 & 4.79\end{bmatrix}$
$\begin{bmatrix}-2.28 & -1.91 & 1.66\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

761. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 1) in a 681 x 467 image with the following parameters? l=0, r=1, b=-2, t=0 view type = orthographic
camera origin = $\begin{bmatrix}3.0 & -4.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.0 & 0.2 & -0.98\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.76 & -0.46 & -0.46\end{bmatrix}$

camera w axis = $\begin{bmatrix}-0.18 & -0.37 & -0.91\end{bmatrix}$

762. Ray R has starting point e=$\begin{bmatrix}-1.13 & 4.29 & 2.38\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.69 & -0.23 & -0.69\end{bmatrix}$ . Polygon P has vertices $\begin{bmatrix}3.29 & 1.39 & 1.94\end{bmatrix}$ $\begin{bmatrix}4.44 & 0.25 & 1.94\end{bmatrix}$ $\begin{bmatrix}2.61 & 1.16 & 4.69\end{bmatrix}$ $\begin{bmatrix}-0.38 & 4.84 & 2.62\end{bmatrix}$ $\begin{bmatrix}2.84 & 1.16 & 4.0\end{bmatrix}$ .
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

763. Ray R has starting point e=$\begin{bmatrix}-1.84 & -8.26 & -5.89\end{bmatrix}$ and direction d=$\begin{bmatrix}0.62 & 0.62 & 0.49\end{bmatrix}$ . Polygon P has vertices $\begin{bmatrix}3.79 & -2.74 & -1.74\end{bmatrix}$ $\begin{bmatrix}2.85 & 1.06 & -2.05\end{bmatrix}$ $\begin{bmatrix}2.85 & -8.11 & -2.05\end{bmatrix}$ $\begin{bmatrix}-3.79 & -8.11 & -4.26\end{bmatrix}$ $\begin{bmatrix}3.79 & -2.74 & -1.74\end{bmatrix}$ .
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

764. Ray R has starting point e=$\begin{bmatrix}-6.88 & -0.91 & -0.1\end{bmatrix}$ and direction d=$\begin{bmatrix}0.71 & -0.57 & -0.42\end{bmatrix}$ . Polygon P has vertices $\begin{bmatrix}0.06 & 1.6 & -4.03\end{bmatrix}$ $\begin{bmatrix}-5.62 & -2.14 & 2.95\end{bmatrix}$ $\begin{bmatrix}-3.03 & -4.41 & -2.89\end{bmatrix}$ $\begin{bmatrix}-4.97 & -0.03 & 3.27\end{bmatrix}$ $\begin{bmatrix}-4.65 & -1.65 & 1.65\end{bmatrix}$ .
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

765. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 1) in a 576 x 579 image with the following parameters? l=3, r=4, b=-1, t=0 view type = perspective
camera origin = $\begin{bmatrix}4.0 & -2.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.27 & 0.8 & 0.53\end{bmatrix}$

camera v axis = $\begin{bmatrix}-0.87 & 0.44 & 0.22\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.94 & -0.24 & -0.24\end{bmatrix}$
image plane at distance 1 in front of viewpoint

766. Ray R has starting point e=$\begin{bmatrix}4.1 & 2.44 & 3.65\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.69 & -0.23 & -0.69\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}4.8 & 2.8 & -1.8\end{bmatrix}$
$\begin{bmatrix}6.14 & 8.15 & -4.47\end{bmatrix}$
$\begin{bmatrix}0.53 & 0.93 & 1.67\end{bmatrix}$
$\begin{bmatrix}2.13 & -2.28 & 1.67\end{bmatrix}$
$\begin{bmatrix}3.47 & 3.07 & -1.0\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

767. Ray R has starting point e=$\begin{bmatrix}-4.77 & -9.25 & 0.08\end{bmatrix}$
and direction d=$\begin{bmatrix}0.44 & 0.87 & 0.22\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}4.73 & -3.51 & 0.0\end{bmatrix}$
$\begin{bmatrix}4.49 & -6.91 & -4.85\end{bmatrix}$
$\begin{bmatrix}-0.85 & -5.94 & 1.94\end{bmatrix}$
$\begin{bmatrix}8.12 & -1.57 & -0.49\end{bmatrix}$
$\begin{bmatrix}5.94 & -5.46 & -4.12\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

768. Ray R has starting point e=$\begin{bmatrix}-2.21 & -0.74 & -1.08\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.62 & -0.0 & 0.78\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}1.13 & -3.41 & 3.67\end{bmatrix}$
$\begin{bmatrix}-2.08 & -1.27 & -1.14\end{bmatrix}$
$\begin{bmatrix}6.74 & -2.6 & 5.28\end{bmatrix}$
$\begin{bmatrix}-0.47 & -0.2 & -1.94\end{bmatrix}$
$\begin{bmatrix}5.94 & -1.8 & 3.67\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

769. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 0) in a 442 x 479 image with the following parameters? l=0, r=1, b=-5, t=-4 view type = perspective camera origin = $\begin{bmatrix}2.0 & -2.0 & 2.0\end{bmatrix}$

camera u axis = $\begin{bmatrix}0.49 & -0.49 & -0.73\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.27 & 0.8 & -0.53\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.44 & 0.87 & 0.22\end{bmatrix}$
image plane at distance 0 in front of viewpoint

770. Ray R has starting point e=$\begin{bmatrix}2.47 & -2.4 & 1.06\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.0 & -0.71 & -0.71\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}3.89 & -0.46 & 3.57\end{bmatrix}$
$\begin{bmatrix}3.2 & -4.57 & -0.03\end{bmatrix}$
$\begin{bmatrix}0.8 & -2.17 & -0.03\end{bmatrix}$
$\begin{bmatrix}3.54 & -2.17 & 2.03\end{bmatrix}$
$\begin{bmatrix}5.43 & -4.06 & 2.03\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

771. Ray R has starting point e=$\begin{bmatrix}-1.71 & -0.96 & 4.52\end{bmatrix}$
and direction d=$\begin{bmatrix}0.89 & 0.45 & -0.0\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-1.46 & 2.75 & 2.62\end{bmatrix}$
$\begin{bmatrix}-3.06 & 2.06 & 1.25\end{bmatrix}$
$\begin{bmatrix}0.84 & -2.75 & 6.75\end{bmatrix}$
$\begin{bmatrix}-3.52 & 4.13 & 0.1\end{bmatrix}$
$\begin{bmatrix}-3.29 & 2.75 & 0.79\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

772. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 3) in a 556 x 427 image with the following parameters? l=-5, r=-4, b=-4, t=-3 view type = orthographic
camera origin = $\begin{bmatrix}0.0 & -2.0 & 2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.27 & -0.53 & -0.8\end{bmatrix}$
camera v axis = $\begin{bmatrix}1.0 & 0.0 & 0.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.33 & -0.67 & -0.67\end{bmatrix}$

773. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 2) in a 362 x 688 image with the following parameters? l=2, r=3, b=-1, t=1 view type = orthographic
camera origin = $\begin{bmatrix}-1.0 & -5.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.55 & 0.0 & -0.83\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.8 & -0.27 & -0.53\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.24 & -0.94 & 0.24\end{bmatrix}$

774. Ray R has starting point e=$\begin{bmatrix}-6.66 & 0.08 & -6.05\end{bmatrix}$ and direction d=$\begin{bmatrix}0.37 & 0.91 & 0.18\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-6.12 & 3.5 & -5.25\end{bmatrix}$ $\begin{bmatrix}-5.97 & 2.25 & -6.03\end{bmatrix}$ $\begin{bmatrix}-3.31 & 4.12 & -1.97\end{bmatrix}$ $\begin{bmatrix}-3.62 & 5.37 & -1.35\end{bmatrix}$ $\begin{bmatrix}-7.84 & 1.62 & -8.37\end{bmatrix}$ .
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

775. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 0) in a 275 x 616 image with the following parameters? l=2, r=4, b=1, t=2 view type = orthographic camera origin = $\begin{bmatrix}-3.0 & -3.0 & 4.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.41 & 0.41 & 0.82\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.82 & 0.41 & -0.41\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.2 & 0.59 & -0.78\end{bmatrix}$

776. Ray R has starting point e=$\begin{bmatrix}-2.82 & 3.81 & 2.25\end{bmatrix}$ and direction d=$\begin{bmatrix}0.71 & -0.0 & -0.71\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}4.34 & 1.66 & 2.66\end{bmatrix}$ $\begin{bmatrix}-0.21 & 6.74 & 6.94\end{bmatrix}$ $\begin{bmatrix}3.8 & -0.47 & 4.53\end{bmatrix}$ $\begin{bmatrix}6.21 & -2.35 & 1.86\end{bmatrix}$ $\begin{bmatrix}1.66 & 5.94 & 4.53\end{bmatrix}$ .
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

777. Ray R has starting point e=$\begin{bmatrix}-2.04 & -1.91 & 1.0\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.89 & 0.45 & -0.0\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}1.81 & 0.62 & 4.78\end{bmatrix}$ $\begin{bmatrix}2.13 & 0.62 & 4.78\end{bmatrix}$ $\begin{bmatrix}3.53 & -0.62 & 3.22\end{bmatrix}$ $\begin{bmatrix}7.44 & -2.5 & 0.88\end{bmatrix}$ $\begin{bmatrix}2.59 & 1.25 & 5.56\end{bmatrix}$ .
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

778. Ray R has starting point e=$\begin{bmatrix}4.45 & -3.26 & 2.85\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.33 & 0.67 & -0.67\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}0.91 & -1.52 & 2.96\end{bmatrix}$ $\begin{bmatrix}5.79 & -3.09 & 2.61\end{bmatrix}$ $\begin{bmatrix}0.91 & -3.09 & 1.39\end{bmatrix}$ $\begin{bmatrix}5.79 & -7.96 & -2.26\end{bmatrix}$ $\begin{bmatrix}2.3 & -3.96 & 0.87\end{bmatrix}$.

b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

779. Ray R has starting point e=$\begin{bmatrix}-8.78 & 5.01 & 1.05\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.27 & -0.8 & -0.53\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-1.0 & 2.0 & -4.85\end{bmatrix}$ $\begin{bmatrix}-1.63 & 0.1 & 1.16\end{bmatrix}$ $\begin{bmatrix}0.26 & 5.79 & -3.58\end{bmatrix}$ $\begin{bmatrix}-1.95 & -0.85 & -0.74\end{bmatrix}$ $\begin{bmatrix}0.58 & 6.74 & -6.74\end{bmatrix}$.

b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

780. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 3) in a 271 x 622 image with the following parameters? l=-4, r=-2, b=-2, t=3 view type = orthographic
camera origin = $\begin{bmatrix}-1.0 & 0.0 & -5.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.0 & -0.71 & -0.71\end{bmatrix}$
camera v axis = $\begin{bmatrix}-1.0 & 0.0 & 0.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.85 & 0.17 & -0.51\end{bmatrix}$

781. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 4) in a 393 x 419 image with the following parameters? l=-4, r=0, b=-2, t=-1 view type = orthographic
camera origin = $\begin{bmatrix}-3.0 & 3.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.17 & 0.7 & -0.7\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.58 & -0.58 & -0.58\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.67 & 0.33 & 0.67\end{bmatrix}$

782. Ray R has starting point e=$\begin{bmatrix}-3.12 & -2.85 & -2.4\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.0 & -0.32 & -0.95\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-3.84 & -2.87 & -0.82\end{bmatrix}$ $\begin{bmatrix}-2.09 & -2.65 & -3.44\end{bmatrix}$ $\begin{bmatrix}-3.18 & -3.53 & -4.75\end{bmatrix}$

$\begin{bmatrix}1.62 & -0.04 & -0.38\end{bmatrix}$
$\begin{bmatrix}1.4 & -0.25 & -0.82\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

783. Ray R has starting point e=$\begin{bmatrix}-12.17 & 1.92 & 1.87\end{bmatrix}$
and direction d=$\begin{bmatrix}0.85 & -0.51 & -0.17\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-4.0 & 1.0 & 2.0\end{bmatrix}$
$\begin{bmatrix}-4.0 & 0.0 & 3.0\end{bmatrix}$
$\begin{bmatrix}-4.0 & 0.0 & 4.0\end{bmatrix}$
$\begin{bmatrix}-4.0 & -5.0 & 1.0\end{bmatrix}$
$\begin{bmatrix}-4.0 & -1.0 & 3.0\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

784. Ray R has starting point e=$\begin{bmatrix}2.61 & 3.54 & -3.65\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.0 & -0.32 & 0.95\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-0.79 & 2.09 & -3.61\end{bmatrix}$
$\begin{bmatrix}-3.57 & 4.0 & -2.39\end{bmatrix}$
$\begin{bmatrix}5.48 & 3.48 & -0.65\end{bmatrix}$
$\begin{bmatrix}7.57 & 1.91 & -1.7\end{bmatrix}$
$\begin{bmatrix}0.61 & 6.96 & 1.61\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

785. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 2) in a 320 x 507 image with the following parameters? l=-1, r=1, b=-1, t=0 view type = orthographic
camera origin = $\begin{bmatrix}3.0 & 0.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.62 & -0.77 & -0.15\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.83 & 0.0 & -0.55\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.47 & 0.62 & -0.62\end{bmatrix}$

786. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 3) in a 621 x 361 image with the following parameters? l=-4, r=0, b=-5, t=-1 view type = orthographic
camera origin = $\begin{bmatrix}-5.0 & 2.0 & 2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.64 & 0.64 & 0.43\end{bmatrix}$

camera v axis = $\begin{bmatrix}-0.82 & 0.41 & 0.41\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.33 & -0.67 & -0.67\end{bmatrix}$

787. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 0) in a 391 x 360 image with the following parameters? l=1, r=4, b=-1, t=0 view type = orthographic
camera origin = $\begin{bmatrix}2.0 & -4.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.71 & -0.71 & 0.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.97 & -0.24 & 0.0\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.62 & -0.49 & -0.62\end{bmatrix}$

788. Ray R has starting point e=$\begin{bmatrix}-12.49 & 1.63 & -1.77\end{bmatrix}$
and direction d=$\begin{bmatrix}0.58 & -0.58 & 0.58\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-2.49 & -0.59 & -2.45\end{bmatrix}$
$\begin{bmatrix}5.27 & -1.0 & 1.63\end{bmatrix}$
$\begin{bmatrix}-2.49 & -1.41 & -2.04\end{bmatrix}$
$\begin{bmatrix}4.45 & -3.45 & 2.45\end{bmatrix}$
$\begin{bmatrix}0.78 & -7.12 & 2.45\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

789. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 0) in a 618 x 300 image with the following parameters? l=-5, r=3, b=2, t=3 view type = orthographic
camera origin = $\begin{bmatrix}-3.0 & 1.0 & 3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.89 & -0.45 & 0.0\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.7 & 0.17 & -0.7\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.45 & -0.89 & 0.0\end{bmatrix}$

790. Ray R has starting point e=$\begin{bmatrix}-8.83 & 2.53 & 2.17\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.45 & -0.0 & -0.89\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-7.86 & 4.41 & 0.22\end{bmatrix}$
$\begin{bmatrix}-4.18 & 6.45 & -2.63\end{bmatrix}$
$\begin{bmatrix}-9.49 & 1.96 & 2.27\end{bmatrix}$
$\begin{bmatrix}-9.9 & 6.45 & 0.22\end{bmatrix}$
$\begin{bmatrix}-4.59 & 0.33 & 0.63\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

791. Ray R has starting point e=$\begin{bmatrix}-0.49 & 0.42 & 2.88\end{bmatrix}$
and direction d=$\begin{bmatrix}0.27 & 0.8 & 0.53\end{bmatrix}$

. Polygon P has vertices $\begin{bmatrix}1.12 & -1.97 & 5.12\end{bmatrix}$
$\begin{bmatrix}0.27 & -0.27 & 3.42\end{bmatrix}$
$\begin{bmatrix}-4.54 & 5.53 & 0.17\end{bmatrix}$
$\begin{bmatrix}-3.83 & 3.26 & 3.0\end{bmatrix}$
$\begin{bmatrix}0.7 & -1.55 & 4.98\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

792. Ray R has starting point e=$\begin{bmatrix}-4.15 & -9.55 & -7.95\end{bmatrix}$
and direction d=$\begin{bmatrix}0.42 & 0.71 & 0.57\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}1.0 & -9.0 & -5.0\end{bmatrix}$
$\begin{bmatrix}-3.0 & -5.0 & -5.0\end{bmatrix}$
$\begin{bmatrix}-1.0 & -3.0 & -5.0\end{bmatrix}$
$\begin{bmatrix}1.0 & -9.0 & -5.0\end{bmatrix}$
$\begin{bmatrix}-7.0 & -5.0 & -5.0\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

793. Ray R has starting point e=$\begin{bmatrix}3.15 & 0.24 & 1.58\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.78 & -0.2 & 0.59\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-1.54 & 4.83 & 5.54\end{bmatrix}$
$\begin{bmatrix}-1.54 & -3.66 & 5.54\end{bmatrix}$
$\begin{bmatrix}4.12 & -0.83 & -0.12\end{bmatrix}$
$\begin{bmatrix}2.71 & 6.24 & 1.29\end{bmatrix}$
$\begin{bmatrix}4.83 & 2.0 & -0.83\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

794. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 1) in a 622 x 478 image with the following parameters? l=-5, r=-2, b=-5, t=4 view type = orthographic
camera origin = $\begin{bmatrix}3.0 & -5.0 & 0.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.0 & 0.55 & 0.83\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.53 & -0.8 & 0.27\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.0 & -0.6 & 0.8\end{bmatrix}$

795. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 2) in a 302

x 485 image with the following parameters? l=-3, r=4, b=-1, t=0 view type = perspective
camera origin = $\begin{bmatrix}1.0 & -2.0 & -3.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.35 & -0.87 & -0.35\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.58 & -0.58 & 0.58\end{bmatrix}$
camera w axis = $\begin{bmatrix}0.62 & 0.62 & -0.47\end{bmatrix}$
image plane at distance 0 in front of viewpoint

796. Ray R has starting point e=$\begin{bmatrix}-7.3 & -0.71 & 4.37\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.41 & 0.41 & -0.82\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}3.34 & -1.79 & -0.58\end{bmatrix}$
$\begin{bmatrix}-0.24 & -1.34 & 0.32\end{bmatrix}$
$\begin{bmatrix}4.68 & -0.89 & 1.21\end{bmatrix}$
$\begin{bmatrix}4.68 & 1.34 & 5.68\end{bmatrix}$
$\begin{bmatrix}2.45 & -0.89 & 1.21\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

797. Ray R has starting point e=$\begin{bmatrix}-1.16 & 0.56 & 6.01\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.27 & 0.53 & 0.8\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}-2.67 & 3.33 & 9.33\end{bmatrix}$
$\begin{bmatrix}1.67 & -2.33 & 6.67\end{bmatrix}$
$\begin{bmatrix}-2.0 & 1.67 & 7.33\end{bmatrix}$
$\begin{bmatrix}-4.0 & 2.67 & 5.33\end{bmatrix}$
$\begin{bmatrix}-3.67 & 2.0 & 4.67\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

798. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 4) in a 739 x 645 image with the following parameters? l=-3, r=2, b=-5, t=4 view type = orthographic
camera origin = $\begin{bmatrix}-4.0 & 0.0 & -1.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}0.41 & -0.82 & -0.41\end{bmatrix}$
camera v axis = $\begin{bmatrix}0.71 & 0.0 & -0.71\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.91 & -0.37 & 0.18\end{bmatrix}$

799. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 1) in a 717 x 641 image with the following parameters? l=-4, r=-2, b=-5, t=-3 view type = perspective
camera origin = $\begin{bmatrix}-4.0 & -2.0 & -2.0\end{bmatrix}$
camera u axis = $\begin{bmatrix}-0.44 & 0.87 & -0.22\end{bmatrix}$
camera v axis = $\begin{bmatrix}-0.66 & 0.53 & -0.53\end{bmatrix}$
camera w axis = $\begin{bmatrix}-0.74 & -0.37 & 0.56\end{bmatrix}$

image plane at distance 0 in front of viewpoint

800. Ray R has starting point e=$\begin{bmatrix}-1.33 & 5.6 & -0.42\end{bmatrix}$
and direction d=$\begin{bmatrix}-0.78 & -0.2 & 0.59\end{bmatrix}$
. Polygon P has vertices $\begin{bmatrix}1.75 & 3.23 & 0.69\end{bmatrix}$
$\begin{bmatrix}3.13 & 6.67 & -2.29\end{bmatrix}$
$\begin{bmatrix}2.44 & 0.48 & 3.67\end{bmatrix}$
$\begin{bmatrix}0.38 & 2.77 & 0.69\end{bmatrix}$
$\begin{bmatrix}3.82 & 5.52 & -0.92\end{bmatrix}$
.
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?