Please note: This set of generated review questions has errors for two kinds of questions: ray casting (perspective) and polygon intersection. In the case of ray casting, the perspective questions are missing information about the distance of the image plane. In the case of polygon intersection, question (e) (is the intersection point inside the polygon) often has the incorrect answer. Please see ray_tracing_review.perspective_and_polygon.pdf to review those question types.

1. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 3) in a 724 x 344 image with the following parameters? l=-5, r=-4, b=0, t=4 view type = orthographic camera origin = $\begin{bmatrix}-2.0 & 3.0 & -1.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.82 & 0.41 & -0.41\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.0 & -0.71 & -0.71\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.56 & -0.74 & 0.37\end{bmatrix}$

2. Ray R has starting point e=$\begin{bmatrix}-5.58 & 4.41 & 0.42\end{bmatrix}$ and direction d=$\begin{bmatrix}0.8 & 0.27 & 0.53\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-1.38 & -0.06 & -1.59\end{bmatrix}\begin{bmatrix}-4.5 & 5.87 & 2.0\end{bmatrix}\begin{bmatrix}-1.38 & 3.22 & 1.69\end{bmatrix}\begin{bmatrix}1.12 & 5.56 & 5.9\end{bmatrix}\begin{bmatrix}1.75 & 1.19 & 2.$
   b) What is the normal to P?
   c) What is the t intersection point of R and P?
   d) What is the (x, y, z) intersection point on R at t?
   e) Is the intersection point inside the polygon?
   f) Is the intersection point in front of the viewpoint e?

3. Triangle T has vertices p0=$\begin{bmatrix}-0.47 & 5.71 & -6.23\end{bmatrix}$, p1=$\begin{bmatrix}-2.33 & 3.11 & -5.49\end{bmatrix}$, p2=$\begin{bmatrix}-3.63 & 1.63 & -4.74\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-4.52 & 2.35 & 1.31\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.51 & 0.85 & -0.17\end{bmatrix}$.
   b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
   c) Is the intersection point inside the triangle?
   d) Is the intersection point in front of the viewpoint e?

4. Triangle T has vertices p0=$\begin{bmatrix}1.0 & 1.0 & 2.0\end{bmatrix}$, p1=$\begin{bmatrix}2.41 & -1.83 & 3.41\end{bmatrix}$, p2=$\begin{bmatrix}-1.12 & -1.12 & -0.12\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}2.31 & -2.26 & 4.25\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.33 & 0.67 & -0.67\end{bmatrix}$.
   b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
   c) Is the intersection point inside the triangle?
   d) Is the intersection point in front of the viewpoint e?

5. Ray R has starting point e=$\begin{bmatrix}-5.83 & -4.2 & -5.95\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.0 & -0.32 & 0.95\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-5.73 & -5.11 & -5.73\end{bmatrix}\begin{bmatrix}-8.29 & 1.64 & -3.36\end{bmatrix}\begin{bmatrix}-0.25 & -3.29 & -7.56\end{bmatrix}\begin{bmatrix}0.48 & 1.83 & -6$
   b) What is the normal to P?
   c) What is the t intersection point of R and P?
   d) What is the (x, y, z) intersection point on R at t?
   e) Is the intersection point inside the polygon?
   f) Is the intersection point in front of the viewpoint e?

6. What are the A, B, and C components of the line passing through $\begin{bmatrix}-3.0 & 2.0 & 3.0\end{bmatrix}$ and $\begin{bmatrix}-2.0 & -4.0 & -5.0\end{bmatrix}$, where Ax + By + C = 0

7. What are the barycentric coordinates of point P=$\begin{bmatrix}-1.27 & -0.72 & 0.36\end{bmatrix}$ with respect to triangle T with vertices 3.00 -3.00 -3.00 -4.00 -4.00 2.00 1.00 2.00 -1.00?
   b) Is point P inside or outside T?
   c) If vertex 0 has color $\begin{bmatrix}1.7 & 1.0 & 1.7\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}0.5 & 0.5 & 1.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.3 & 0.3 & 1.0\end{bmatrix}$, what is P's color?

8. What are the barycentric coordinates of point P=$\begin{bmatrix}-2.13 & 1.68 & 1.0\end{bmatrix}$ with respect to triangle T with vertices 3.00 2.00 -1.00 0.00 3.00 -2.00 4.00 1.00 -5.00?
   b) Is point P inside or outside T?
   c) If vertex 0 has color $\begin{bmatrix}2.5 & 1.0 & 2.5\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 0.0 & 0.5\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.0 & 1.0 & 2.5\end{bmatrix}$, what is P's color?

9. Ray R has starting point e=$\begin{bmatrix}4.27 & -1.08 & -0.26\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.83 & 0.55 & -0.0\end{bmatrix}$.
Polygon P has vertices $\begin{bmatrix}3.31 & 0.74 & 0.54\end{bmatrix}\begin{bmatrix}9.32 & -5.26 & 0.54\end{bmatrix}\begin{bmatrix}2.97 & -0.29 & -0.49\end{bmatrix}\begin{bmatrix}4.51 & -3.89 & -2.03\end{bmatrix}\begin{bmatrix}5.$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection 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 A, B, and C components of the line passing through $\begin{bmatrix}1.0 & 2.0 & 4.0\end{bmatrix}$ and $\begin{bmatrix}2.0 & 1.0 & 3.0\end{bmatrix}$, where Ax + By + C = 0

11. Triangle T has vertices p0=$\begin{bmatrix}-8.01 & 3.65 & -4.59\end{bmatrix}$, p1=$\begin{bmatrix}-1.41 & 0.82 & 0.12\end{bmatrix}$, p2=$\begin{bmatrix}-2.59 & 2.71 & -6.24\end{bmatrix}$.
Ray R has starting point e=$\begin{bmatrix}-13.07 & 1.37 & 0.98\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.22 & 0.44 & 0.87\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

12. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 4) in a 386 x 706 image with the following parameters? l=1, r=3, b=-1, t=0 view type = perspective camera origin = $\begin{bmatrix}3.0 & 1.0 & -2.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.44 & -0.22 & 0.87\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.58 & -0.58 & 0.58\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.85 & -0.17 & -0.51\end{bmatrix}$

13. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 1) in a 541 x 487 image with the following parameters? l=-3, r=1, b=-2, t=3 view type = orthographic camera origin = $\begin{bmatrix}-5.0 & -3.0 & -1.0\end{bmatrix}$ 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 = $\begin{bmatrix}-0.6 & -0.75 & -0.3\end{bmatrix}$

14. What are the A, B, and C components of the line passing through $\begin{bmatrix}1.0 & 2.0 & -4.0\end{bmatrix}$ and $\begin{bmatrix}0.0 & 3.0 & -2.0\end{bmatrix}$, where Ax + By + C = 0

15. Ray R has starting point e=$\begin{bmatrix}-13.49 & -4.89 & 1.58\end{bmatrix}$ and direction d=$\begin{bmatrix}0.74 & 0.37 & -0.56\end{bmatrix}$.
Polygon P has vertices $\begin{bmatrix}-1.78 & -2.62 & 1.53\end{bmatrix}\begin{bmatrix}-3.34 & -3.87 & -4.87\end{bmatrix}\begin{bmatrix}1.34 & -0.13 & -6.75\end{bmatrix}\begin{bmatrix}-4.12 & -4.5 & -$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

16. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 3) in a 458 x 254 image with the following parameters? l=2, r=3, b=2, t=4 view type = orthographic camera origin = $\begin{bmatrix}4.0 & 2.0 & -1.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.96 & 0.19 & -0.19\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.51 & 0.0 & -0.86\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.17 & 0.7 & 0.7\end{bmatrix}$

17. What are the A, B, and C components of the line passing through $\begin{bmatrix}2.0 & 0.0 & -5.0\end{bmatrix}$ and $\begin{bmatrix}3.0 & -1.0 & 3.0\end{bmatrix}$, where Ax + By + C = 0

18. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 3) in a 700 x 424 image with the following parameters? l=-5, r=-4, b=-3, t=-2 view type = orthographic camera origin = $\begin{bmatrix}2.0 & 2.0 & -5.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.17 & -0.7 & 0.7\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.49 & 0.49 & -0.73\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.67 & 0.67 & 0.33\end{bmatrix}$

19. What are the barycentric coordinates of point P=$\begin{bmatrix}-4.77 & -1.53 & 1.0\end{bmatrix}$ with respect to triangle T with vertices 2.00 4.00 0.00 -3.00 -4.00 -4.00 3.00 2.00 4.00?
    b) Is point P inside or outside T?
    c) If vertex 0 has color $\begin{bmatrix}1.0 & 2.0 & 3.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 1.0 & 0.5\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}5.0 & 4.0 & 1.0\end{bmatrix}$, what is P's color?

20. Triangle T has vertices p0=$\begin{bmatrix}2.82 & -6.08 & -1.45\end{bmatrix}$, p1=$\begin{bmatrix}-1.27 & 2.9 & -0.63\end{bmatrix}$, p2=$\begin{bmatrix}2.82 & -2.0 & 2.63\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}2.44 & -2.71 & 1.74\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.49 & 0.73 & -0.49\end{bmatrix}$.
    b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
    c) Is the intersection point inside the triangle?
    d) 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, 2) in a 567 x 556 image with the following parameters? l=0, r=2, b=-4, t=-1 view type = orthographic camera origin = $\begin{bmatrix}1.0 & 2.0 & 1.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.58 & -0.58 & 0.58\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.45 & -0.89 & 0.0\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.71 & 0.0 & 0.71\end{bmatrix}$

22. What are the A, B, and C components of the line passing through $\begin{bmatrix}-1.0 & -3.0 & -1.0\end{bmatrix}$ and $\begin{bmatrix}-4.0 & -5.0 & -4.0\end{bmatrix}$, where Ax + By + C = 0

23. What are the A, B, and C components of the line passing through $\begin{bmatrix}-1.0 & -3.0 & -5.0\end{bmatrix}$ and $\begin{bmatrix}-3.0 & -5.0 & -3.0\end{bmatrix}$, where Ax + By + C = 0

24. What are the A, B, and C components of the line passing through $\begin{bmatrix}0.0 & -1.0 & -4.0\end{bmatrix}$ and $\begin{bmatrix}4.0 & -4.0 & 4.0\end{bmatrix}$, where Ax + By + C = 0

25. What are the A, B, and C components of the line passing through $\begin{bmatrix}-4.0 & 2.0 & -3.0\end{bmatrix}$ and $\begin{bmatrix}-2.0 & -5.0 & -5.0\end{bmatrix}$, where Ax + By + C = 0

26. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 3) in a 601 x 495 image with the following parameters? l=-5, r=-4, b=-5, t=-2 view type = orthographic camera origin = $\begin{bmatrix}1.0 & -2.0 & -3.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.58 & -0.58 & 0.58\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.68 & 0.27 & -0.68\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.59 & 0.78 & -0.2\end{bmatrix}$

27. What are the barycentric coordinates of point P=$\begin{bmatrix}-11.64 & 0.95 & 1.0\end{bmatrix}$ with respect to triangle T with vertices 3.00 -4.00 -1.00 -1.00 -4.00 -3.00 -3.00 1.00 -3.00?
    b) Is point P inside or outside T?
    c) If vertex 0 has color $\begin{bmatrix}1.0 & 1.5 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}0.0 & 1.0 & 0.8\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.5 & 1.0 & 2.0\end{bmatrix}$, what is P's color?

28. What are the A, B, and C components of the line passing through $\begin{bmatrix}1.0 & 2.0 & -2.0\end{bmatrix}$ and $\begin{bmatrix}-1.0 & 1.0 & 3.0\end{bmatrix}$, where Ax + By + C = 0

29. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 4) in a 452 x 580 image with the following parameters? l=4, r=5, b=-5, t=-4 view type = perspective camera origin = $\begin{bmatrix}4.0 & -1.0 & -3.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.76 & 0.46 & -0.46\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.46 & -0.76 & -0.46\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.22 & -0.44 & 0.87\end{bmatrix}$

30. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 1) in a 574 x 393 image with the following parameters? l=-4, r=1, b=-1, t=0 view type = perspective camera origin = $\begin{bmatrix}-5.0 & -5.0 & 1.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.27 & 0.8 & 0.53\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.71 & -0.71 & 0.0\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.56 & 0.37 & -0.74\end{bmatrix}$

31. Triangle T has vertices p0=$\begin{bmatrix}-5.94 & 2.12 & 0.41\end{bmatrix}$, p1=$\begin{bmatrix}0.92 & 2.51 & 1.78\end{bmatrix}$, p2=$\begin{bmatrix}-1.04 & -5.14 & 1.39\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-2.48 & -1.85 & 3.3\end{bmatrix}$ and direction d=$\begin{bmatrix}0.77 & 0.15 & -0.62\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

32. What are the barycentric coordinates of point P=$\begin{bmatrix}-2.01 & -1.34 & -0.33\end{bmatrix}$ with respect to triangle T with vertices -2.00 -3.00 -1.00 -3.00 1.00 1.00 1.00 0.00 -1.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.0 & 4.0 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}0.0 & 0.2 & 1.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.0 & 0.5 & 0.0\end{bmatrix}$, what is P's color?

33. Triangle T has vertices p0=$\begin{bmatrix}-5.54 & 3.83 & 5.89\end{bmatrix}$, p1=$\begin{bmatrix}-5.03 & 4.51 & 5.89\end{bmatrix}$, p2=$\begin{bmatrix}-5.03 & 0.4 & 1.77\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-5.9 & 4.71 & 5.31\end{bmatrix}$ and direction d=$\begin{bmatrix}0.53 & -0.8 & -0.27\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

34. Triangle T has vertices p0=$\begin{bmatrix}3.35 & 0.87 & -0.09\end{bmatrix}$, p1=$\begin{bmatrix}1.61 & -0.35 & -2.18\end{bmatrix}$, p2=$\begin{bmatrix}6.48 & 3.31 & 2.7\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}6.95 & -1.89 & 4.16\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.47 & 0.62 & -0.62\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

35. What are the barycentric coordinates of point P=$\begin{bmatrix}-9.81 & -1.67 & 1.0\end{bmatrix}$ with respect to triangle T with vertices 0.00 -1.00 2.00 -3.00 -4.00 -1.00 -2.00 -5.00 4.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}0.3 & 1.0 & 0.3\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}0.7 & 1.0 & 0.7\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}0.2 & 1.0 & 0.8\end{bmatrix}$, what is P's color?

36. What are the A, B, and C components of the line passing through $\begin{bmatrix}4.0 & -4.0 & -3.0\end{bmatrix}$ and $\begin{bmatrix}-3.0 & -5.0 & 3.0\end{bmatrix}$, where Ax + By + C = 0

37. What are the A, B, and C components of the line passing through $\begin{bmatrix}3.0 & -3.0 & -3.0\end{bmatrix}$ and $\begin{bmatrix}-3.0 & -5.0 & -3.0\end{bmatrix}$, where Ax + By + C = 0

38. What are the barycentric coordinates of point P=$\begin{bmatrix}-4.26 & 0.06 & -4.28\end{bmatrix}$ with respect to triangle T with vertices 1.00 1.00 -1.00 -5.00 -2.00 -5.00 -4.00 1.00 -4.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}0.0 & 0.5 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 0.0 & 5.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}0.5 & 0.8 & 1.0\end{bmatrix}$, what is P's color?

39. What are the barycentric coordinates of point P=$\begin{bmatrix}-11.27 & -1.47 & 1.0\end{bmatrix}$ with respect to triangle T with vertices 2.00 4.00 -2.00 -1.00 -2.00 2.00 -2.00 -4.00 -5.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.5 & 2.5 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 1.0 & 0.2\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}2.0 & 1.0 & 0.5\end{bmatrix}$, what is P's color?

40. What are the A, B, and C components of the line passing through $\begin{bmatrix}-5.0 & -5.0 & -4.0\end{bmatrix}$ and $\begin{bmatrix}3.0 & -1.0 & -3.0\end{bmatrix}$, where Ax + By + C = 0

41. Ray R has starting point e=$\begin{bmatrix}5.17 & 1.33 & -2.13\end{bmatrix}$ and direction d=$\begin{bmatrix}0.45 & -0.0 & -0.89\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}7.71 & 0.51 & 1.53\end{bmatrix}\begin{bmatrix}5.86 & 1.26 & -7.57\end{bmatrix}\begin{bmatrix}2.14 & 2.74 & -1.07\end{bmatrix}\begin{bmatrix}-0.64 & 3.86 & 0.04\end{bmatrix}\begin{bmatrix}6.79 & 0.89$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

42. Ray R has starting point e=$\begin{bmatrix}-2.41 & -6.43 & 1.93\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.58 & 0.58 & -0.58\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}0.21 & -3.61 & 3.44\end{bmatrix}\begin{bmatrix}4.57 & -7.79 & 0.13\end{bmatrix}\begin{bmatrix}1.61 & -2.91 & 1.87\end{bmatrix}\begin{bmatrix}3.87 & -6.39 & 0.48\end{bmatrix}\begin{bmatrix}3.52$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection 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 A, B, and C components of the line passing through $\begin{bmatrix}-3.0 & -5.0 & 0.0\end{bmatrix}$ and $\begin{bmatrix}-3.0 & -3.0 & 0.0\end{bmatrix}$, where Ax + By + C = 0

44. Triangle T has vertices p0=$\begin{bmatrix}3.0 & -2.0 & 0.0\end{bmatrix}$, p1=$\begin{bmatrix}4.07 & 0.14 & -3.74\end{bmatrix}$, p2=$\begin{bmatrix}5.67 & -3.6 & 1.07\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}4.7 & -1.96 & -1.04\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.89 & 0.45 & -0.0\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

45. Ray R has starting point e=$\begin{bmatrix}-6.44 & -2.23 & -1.92\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.0 & -0.0 & 1.0\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}4.93 & -0.63 & 2.49\end{bmatrix}\begin{bmatrix}2.89 & -2.11 & -1.23\end{bmatrix}\begin{bmatrix}1.4 & -1.37 & -2.71\end{bmatrix}\begin{bmatrix}7.53 & -2.49 & 4.71\end{bmatrix}\begin{bmatrix}4.$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection 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. What are the barycentric coordinates of point P=$\begin{bmatrix}-2.59 & -0.16 & -2.65\end{bmatrix}$ with respect to triangle T with vertices -1.00 -3.00 -1.00 -1.00 -2.00 -2.00 -5.00 4.00 -5.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}2.0 & 1.0 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 1.7 & 0.3\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.0 & 4.0 & 1.0\end{bmatrix}$, what is P's color?

47. Ray R has starting point e=$\begin{bmatrix}1.39 & -0.99 & -6.38\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.46 & -0.46 & 0.76\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-0.31 & -2.54 & -8.4\end{bmatrix}\begin{bmatrix}-0.93 & -3.47 & -7.78\end{bmatrix}\begin{bmatrix}2.77 & 0.39 & -4.7\end{bmatrix}\begin{bmatrix}5.24 & 2.24 & 0.24\end{bmatrix}\begin{bmatrix}2$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

48. What are the barycentric coordinates of point P=$\begin{bmatrix}-6.02 & -0.08 & 1.0\end{bmatrix}$ with respect to triangle T with vertices -4.00 4.00 0.00 -2.00 -1.00 0.00 2.00 3.00 -3.00?
    b) Is point P inside or outside T?
    c) If vertex 0 has color $\begin{bmatrix}1.0 & 1.0 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}0.0 & 1.0 & 0.5\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.0 & 0.5 & 2.0\end{bmatrix}$, what is P's color?

49. Ray R has starting point e=$\begin{bmatrix}-6.87 & 0.2 & 1.0\end{bmatrix}$ and direction d=$\begin{bmatrix}0.89 & -0.45 & -0.0\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}3.19 & -3.2 & 5.71\end{bmatrix}\begin{bmatrix}-0.71 & -3.2 & 0.51\end{bmatrix}\begin{bmatrix}5.79 & 4.23 & 4.23\end{bmatrix}\begin{bmatrix}-1.09 & -2.27 & -0.6\end{bmatrix}\begin{bmatrix}4.11 & 1.44$
    b) What is the normal to P?
    c) What is the t intersection point of R and P?
    d) What is the (x, y, z) intersection point on R at t?
    e) Is the intersection point inside the polygon?
    f) Is the intersection point in front of the viewpoint e?

50. Ray R has starting point e=$\begin{bmatrix}4.45 & 2.57 & 0.31\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.44 & 0.22 & 0.87\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}3.49 & 2.97 & 1.94\end{bmatrix}\begin{bmatrix}4.7 & 2.97 & 3.15\end{bmatrix}\begin{bmatrix}0.33 & 3.94 & 0.24\end{bmatrix}\begin{bmatrix}3.24 & 3.94 & 3.15\end{bmatrix}\begin{bmatrix}4.21 & 0.06 & -1.7\end{bmatrix}$.
    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?

51. What are the barycentric coordinates of point P=$\begin{bmatrix}-4.16 & -2.79 & 1.0\end{bmatrix}$ with respect to triangle T with vertices -2.00 -5.00 1.00 -3.00 -3.00 -1.00 2.00 4.00 -5.00?
    b) Is point P inside or outside T?
    c) If vertex 0 has color $\begin{bmatrix}1.0 & 1.0 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 0.3 & 0.7\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.0 & 1.5 & 1.5\end{bmatrix}$, what is P's color?

52. Ray R has starting point e=$\begin{bmatrix}-6.86 & -0.4 & 2.19\end{bmatrix}$ and direction d=$\begin{bmatrix}0.43 & 0.64 & 0.64\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-7.04 & 0.49 & 2.41\end{bmatrix}\begin{bmatrix}-3.37 & -4.82 & 4.45\end{bmatrix}\begin{bmatrix}-4.59 & -5.63 & 1.18\end{bmatrix}\begin{bmatrix}-4.18 & -5.22 & 2.41\end{bmatrix}\begin{bmatrix}-6$
    b) What is the normal to P?
    c) What is the t intersection point of R and P?
    d) What is the (x, y, z) intersection 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. Ray R has starting point e=$\begin{bmatrix}-8.78 & -2.54 & 1.0\end{bmatrix}$ and direction d=$\begin{bmatrix}0.51 & 0.86 & -0.0\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}0.38 & -1.44 & 4.49\end{bmatrix}\begin{bmatrix}3.0 & -1.22 & 0.13\end{bmatrix}\begin{bmatrix}4.53 & 1.18 & 6.67\end{bmatrix}\begin{bmatrix}5.84 & 1.18 & 4.06\end{bmatrix}\begin{bmatrix}0.6 & -2.09$
    b) What is the normal to P?
    c) What is the t intersection point of R and P?
    d) What is the (x, y, z) intersection point on R at t?
    e) Is the intersection point inside the polygon?
    f) Is the intersection point in front of the viewpoint e?

54. Triangle T has vertices p0=$\begin{bmatrix}-4.0 & -3.0 & 5.0\end{bmatrix}$, p1=$\begin{bmatrix}-4.0 & -3.0 & 0.0\end{bmatrix}$, p2=$\begin{bmatrix}-4.0 & 5.0 & 5.0\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-7.75 & -2.65 & 4.41\end{bmatrix}$ and direction d=$\begin{bmatrix}0.77 & 0.62 & -0.15\end{bmatrix}$.
    b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
    c) Is the intersection point inside the triangle?
    d) Is the intersection point in front of the viewpoint e?

55. What are the barycentric coordinates of point P=$\begin{bmatrix}-1.1 & -0.25 & 1.09\end{bmatrix}$ with respect to triangle T with vertices 1.00 4.00 2.00 -2.00 -5.00 3.00 -3.00 0.00 -3.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}0.0 & 1.0 & 1.5\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 1.2 & 0.2\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.0 & 3.0 & 1.0\end{bmatrix}$, what is P's color?

56. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 4) in a 487 x 729 image with the following parameters? l=-2, r=4, b=-4, t=2 view type = perspective camera origin = $\begin{bmatrix}1.0 & -2.0 & -2.0\end{bmatrix}$ 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 = $\begin{bmatrix}0.33 & -0.67 & 0.67\end{bmatrix}$

57. Triangle T has vertices p0=$\begin{bmatrix}-0.93 & -3.78 & -5.09\end{bmatrix}$, p1=$\begin{bmatrix}-0.06 & -5.96 & -3.78\end{bmatrix}$, p2=$\begin{bmatrix}1.25 & -6.62 & -3.13\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-1.78 & -4.59 & -4.44\end{bmatrix}$ and direction d=$\begin{bmatrix}0.8 & -0.53 & 0.27\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

58. What are the A, B, and C components of the line passing through $\begin{bmatrix}1.0 & -1.0 & -5.0\end{bmatrix}$ and $\begin{bmatrix}-2.0 & -4.0 & 4.0\end{bmatrix}$, where Ax + By + C = 0

59. Triangle T has vertices p0=$\begin{bmatrix}3.9 & 1.38 & -0.44\end{bmatrix}$, p1=$\begin{bmatrix}2.34 & -1.75 & 3.47\end{bmatrix}$, p2=$\begin{bmatrix}-1.41 & 3.87 & 3.0\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-4.63 & 1.47 & 1.0\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.71 & 0.71 & -0.0\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

60. Ray R has starting point e=$\begin{bmatrix}-1.38 & -3.16 & -0.11\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.0 & 0.98 & -0.2\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-1.33 & -1.0 & -0.33\end{bmatrix}\begin{bmatrix}-2.33 & -1.0 & -1.33\end{bmatrix}\begin{bmatrix}1.33 & -3.0 & 1.33\end{bmatrix}\begin{bmatrix}-0.67 & 0.33 & 1.0\end{bmatrix}\begin{bmatrix}0$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection 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. Triangle T has vertices p0=$\begin{bmatrix}-4.0 & 3.31 & -1.54\end{bmatrix}$, p1=$\begin{bmatrix}-7.39 & 5.01 & 3.55\end{bmatrix}$, p2=$\begin{bmatrix}-4.46 & 2.85 & 2.62\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-3.74 & 3.07 & -1.39\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.24 & -0.0 & 0.97\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

62. What are the A, B, and C components of the line passing through $\begin{bmatrix}-2.0 & -4.0 & 3.0\end{bmatrix}$ and $\begin{bmatrix}4.0 & -5.0 & -1.0\end{bmatrix}$, where Ax + By + C = 0

63. What are the barycentric coordinates of point P=$\begin{bmatrix}-6.19 & -4.49 & 1.0\end{bmatrix}$ with respect to triangle T with vertices -2.00 -4.00 -4.00 3.00 -5.00 -4.00 -5.00 -3.00 -1.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.0 & 2.0 & 2.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 2.5 & 1.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}0.2 & 1.0 & 0.0\end{bmatrix}$, what is P's color?

64. What are the A, B, and C components of the line passing through $\begin{bmatrix}4.0 & -3.0 & 2.0\end{bmatrix}$ and $\begin{bmatrix}4.0 & -3.0 & -3.0\end{bmatrix}$, where Ax + By + C = 0

65. What are the A, B, and C components of the line passing through $\begin{bmatrix}-5.0 & -4.0 & 0.0\end{bmatrix}$ and $\begin{bmatrix}1.0 & 3.0 & 4.0\end{bmatrix}$, where Ax + By + C = 0

66. What are the barycentric coordinates of point P=$\begin{bmatrix}-0.38 & 3.0 & 0.92\end{bmatrix}$ with respect to triangle T with vertices 0.00 3.00 1.00 0.00 3.00 0.00 -2.00 3.00 3.00?
    b) Is point P inside or outside T?
    c) If vertex 0 has color $\begin{bmatrix}2.5 & 1.0 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 0.7 & 1.3\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.0 & 0.3 & 0.3\end{bmatrix}$, what is P's color?

67. Triangle T has vertices p0=$\begin{bmatrix}-4.78 & -3.78 & -1.78\end{bmatrix}$, p1=$\begin{bmatrix}-1.45 & -1.04 & -0.8\end{bmatrix}$, p2=$\begin{bmatrix}-1.65 & -1.63 & -2.57\end{bmatrix}$ Ray R has starting point e=$\begin{bmatrix}-11.41 & -2.85 & 2.8\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.58 & 0.58 & -0.58\end{bmatrix}$.
    b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
    c) Is the intersection point inside the triangle?
    d) Is the intersection point in front of the viewpoint e?

68. What are the A, B, and C components of the line passing through $\begin{bmatrix}4.0 & 3.0 & 2.0\end{bmatrix}$ and $\begin{bmatrix}3.0 & -5.0 & -2.0\end{bmatrix}$, where Ax + By + C = 0

69. Ray R has starting point e=$\begin{bmatrix}1.55 & 10.57 & -3.07\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.3 & -0.6 & 0.75\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}0.91 & 5.94 & 0.89\end{bmatrix}\begin{bmatrix}-1.17 & 7.13 & 2.09\end{bmatrix}\begin{bmatrix}2.85 & 7.28 & -1.19\end{bmatrix}\begin{bmatrix}6.43 & 2.36 & -2.09\end{bmatrix}\begin{bmatrix}1.21 & 0.87$
    b) What is the normal to P?
    c) What is the t intersection point of R and P?
    d) What is the (x, y, z) intersection point on R at t?
    e) Is the intersection point inside the polygon?
    f) Is the intersection point in front of the viewpoint e?

70. What are the barycentric coordinates of point P=$\begin{bmatrix}-12.35 & -1.72 & 1.0\end{bmatrix}$ with respect to triangle T with vertices 2.00 -3.00 4.00 -3.00 -5.00 2.00 2.00 3.00 -5.00?
    b) Is point P inside or outside T?
    c) If vertex 0 has color $\begin{bmatrix}5.0 & 1.0 & 5.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 0.2 & 0.5\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}2.5 & 1.0 & 0.5\end{bmatrix}$, what is P's color?

71. Ray R has starting point e=$\begin{bmatrix}-0.29 & -1.05 & -5.93\end{bmatrix}$ and direction d=$\begin{bmatrix}0.74 & -0.37 & -0.56\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}0.0 & 2.81 & -1.25\end{bmatrix}\begin{bmatrix}0.47 & -0.94 & -5.62\end{bmatrix}\begin{bmatrix}0.47 & -4.22 & -10.0\end{bmatrix}\begin{bmatrix}0.78 & 2.5 & -0.63\end{bmatrix}\begin{bmatrix}1.8$
    b) What is the normal to P?
    c) What is the t intersection point of R and P?
    d) What is the (x, y, z) intersection point on R at t?
    e) Is the intersection point inside the polygon?
    f) Is the intersection point in front of the viewpoint e?

72. Ray R has starting point e=$\begin{bmatrix}-9.36 & 4.89 & -1.84\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.0 & -0.8 & 0.6\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-2.66 & 1.86 & -3.21\end{bmatrix}\begin{bmatrix}-1.14 & -0.17 & -0.34\end{bmatrix}\begin{bmatrix}-5.7 & 1.35 & -1.35\end{bmatrix}\begin{bmatrix}-4.18 & -0.17 & 0.68\end{bmatrix}[-$
    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?

73. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 1) in a 571 x 480 image with the following parameters? l=0, r=1, b=0, t=2 view type = perspective camera origin = $\begin{bmatrix}2.0 & -1.0 & -4.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.44 & -0.22 & 0.87\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.17 & -0.85 & -0.51\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.69 & -0.23 & -0.69\end{bmatrix}$

74. Triangle T has vertices p0=$\begin{bmatrix}-2.6 & 0.6 & 2.4\end{bmatrix}$, p1=$\begin{bmatrix}4.08 & -1.27 & 7.47\end{bmatrix}$, p2=$\begin{bmatrix}1.14 & 0.07 & 5.07\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}2.37 & -1.42 & 6.01\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.57 & 0.71 & -0.42\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

75. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 0) in a 706 x 668 image with the following parameters? l=-1, r=3, b=0, t=2 view type = orthographic camera origin = $\begin{bmatrix}-3.0 & -1.0 & 2.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.59 & 0.2 & -0.78\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.19 & -0.96 & 0.19\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.64 & -0.64 & 0.43\end{bmatrix}$

76. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 0) in a 734 x 741 image with the following parameters? l=-4, r=-3, b=-3, t=4 view type = orthographic camera origin = $\begin{bmatrix}3.0 & -1.0 & -1.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.47 & -0.62 & 0.62\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.58 & 0.58 & 0.58\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.49 & -0.62 & -0.62\end{bmatrix}$

77. Ray R has starting point e=$\begin{bmatrix}-14.04 & -2.31 & -3.49\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.15 & 0.62 & 0.77\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-5.1 & 1.64 & 8.02\end{bmatrix}\begin{bmatrix}-5.64 & 0.55 & 1.45\end{bmatrix}\begin{bmatrix}-5.64 & 0.18 & -0.37\end{bmatrix}\begin{bmatrix}-9.11 & 2.01 & 1.82\end{bmatrix}\begin{bmatrix}-4$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

78. Triangle T has vertices p0=$\begin{bmatrix}1.75 & -5.0 & 2.44\end{bmatrix}$, p1=$\begin{bmatrix}0.44 & -4.78 & 2.22\end{bmatrix}$, p2=$\begin{bmatrix}-3.06 & -3.47 & 2.0\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-6.83 & -5.5 & -0.8\end{bmatrix}$ and direction d=$\begin{bmatrix}0.49 & 0.49 & 0.73\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

79. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 0) in a 455 x 491 image with the following parameters? l=-5, r=1, b=-3, t=0 view type = orthographic camera origin = $\begin{bmatrix}-2.0 & -4.0 & 2.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.0 & -0.86 & -0.51\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.87 & -0.22 & -0.44\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.7 & -0.7 & 0.14\end{bmatrix}$

80. What are the barycentric coordinates of point P=$\begin{bmatrix}-7.09 & 0.44 & 1.0\end{bmatrix}$ with respect to triangle T with vertices 3.00 0.00 0.00 2.00 1.00 3.00 2.00 2.00 -2.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}4.0 & 1.0 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}0.0 & 1.0 & 0.5\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.0 & 0.5 & 1.0\end{bmatrix}$, what is P's color?

81. What are the A, B, and C components of the line passing through $\begin{bmatrix}-4.0 & -5.0 & -4.0\end{bmatrix}$ and $\begin{bmatrix}-5.0 & 3.0 & 2.0\end{bmatrix}$, where Ax + By + C = 0

82. What are the barycentric coordinates of point P=$\begin{bmatrix}-10.51 & 0.7 & 1.0\end{bmatrix}$ with respect to triangle T with vertices -4.00 1.00 -3.00 -2.00 -2.00 1.00 -2.00 2.00 1.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.0 & 0.7 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 1.0 & 0.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.0 & 1.0 & 5.0\end{bmatrix}$, what is P's color?

83. Ray R has starting point e=$\begin{bmatrix}0.98 & -1.05 & -5.47\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.9 & -0.3 & 0.3\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-2.56 & -0.35 & -0.91\end{bmatrix}\begin{bmatrix}0.06 & -1.87 & -5.27\end{bmatrix}\begin{bmatrix}-6.93 & -2.31 & -2.65\end{bmatrix}\begin{bmatrix}-2.13 & 0.75 & 1.06\end{bmatrix}$
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?

84. What are the A, B, and C components of the line passing through $\begin{bmatrix}3.0 & 0.0 & -4.0\end{bmatrix}$ and $\begin{bmatrix}3.0 & 4.0 & -4.0\end{bmatrix}$, where Ax + By + C = 0

85. What are the A, B, and C components of the line passing through $\begin{bmatrix}1.0 & -4.0 & -4.0\end{bmatrix}$ and $\begin{bmatrix}3.0 & -1.0 & 1.0\end{bmatrix}$, where Ax + By + C = 0

86. Triangle T has vertices p0=$\begin{bmatrix}3.4 & 2.4 & 0.2\end{bmatrix}$, p1=$\begin{bmatrix}2.6 & -1.8 & 0.8\end{bmatrix}$, p2=$\begin{bmatrix}0.2 & -2.4 & 2.6\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}2.92 & -1.01 & 0.13\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.32 & 0.49 & 0.81\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

87. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 1) in a 670 x 384 image with the following parameters? l=2, r=3, b=1, t=3 view type = orthographic camera origin = $\begin{bmatrix}3.0 & -2.0 & -3.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.41 & 0.41 & 0.82\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.49 & -0.73 & -0.49\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.51 & 0.17 & -0.85\end{bmatrix}$

88. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 3) in a 367 x 251 image with the following parameters? l=-4, r=0, b=0, t=1 view type = perspective camera origin = $\begin{bmatrix}-4.0 & 1.0 & -4.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.23 & 0.69 & -0.69\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.39 & -0.65 & -0.65\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.82 & -0.41 & -0.41\end{bmatrix}$

89. What are the A, B, and C components of the line passing through $\begin{bmatrix}-4.0 & 4.0 & -1.0\end{bmatrix}$ and $\begin{bmatrix}3.0 & 4.0 & 1.0\end{bmatrix}$, where Ax + By + C = 0

90. What are the A, B, and C components of the line passing through $\begin{bmatrix}-3.0 & -3.0 & 2.0\end{bmatrix}$ and $\begin{bmatrix}-2.0 & -1.0 & 1.0\end{bmatrix}$, where Ax + By + C = 0

91. Ray R has starting point e=$\begin{bmatrix}-2.95 & -0.67 & 1.85\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.74 & 0.37 & -0.56\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-3.84 & -1.0 & -2.0\end{bmatrix}\begin{bmatrix}-4.94 & 1.5 & 1.12\end{bmatrix}\begin{bmatrix}-6.34 & -0.38 & -1.22\end{bmatrix}\begin{bmatrix}-0.56 & -1.0 & -2.0\end{bmatrix}$
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?

92. What are the A, B, and C components of the line passing through $\begin{bmatrix}-5.0 & -4.0 & -5.0\end{bmatrix}$ and $\begin{bmatrix}0.0 & -4.0 & -1.0\end{bmatrix}$, where Ax + By + C = 0

93. What are the barycentric coordinates of point P=$\begin{bmatrix}-5.27 & -1.91 & 1.0\end{bmatrix}$ with respect to triangle T with vertices 3.00 -3.00 2.00 -3.00 1.00 -4.00 2.00 3.00 -1.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.0 & 0.2 & 0.5\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}0.2 & 0.2 & 1.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}5.0 & 3.0 & 1.0\end{bmatrix}$, what is P's color?

94. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 3) in a 317 x 578 image with the following parameters? l=-3, r=-1, b=0, t=3 view type = orthographic camera origin = $\begin{bmatrix}-1.0 & 3.0 & 2.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.45 & 0.0 & -0.89\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.0 & -1.0 & 0.0\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.0 & 0.45 & -0.89\end{bmatrix}$

95. What are the A, B, and C components of the line passing through $\begin{bmatrix}-5.0 & 0.0 & 3.0\end{bmatrix}$ and $\begin{bmatrix}-2.0 & 1.0 & -4.0\end{bmatrix}$, where Ax + By + C = 0

96. What are the barycentric coordinates of point P=$\begin{bmatrix}1.32 & -3.81 & -1.66\end{bmatrix}$ with respect to triangle T with vertices 2.00 -5.00 -2.00 -3.00 0.00 -2.00 1.00 2.00 2.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.0 & 1.0 & 0.2\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 1.0 & 4.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}0.3 & 1.0 & 1.0\end{bmatrix}$, what is P's color?

97. What are the barycentric coordinates of point P=$\begin{bmatrix}-1.81 & 0.89 & -4.65\end{bmatrix}$ with respect to triangle T with vertices 0.00 3.00 -4.00 -5.00 2.00 -5.00 -2.00 -1.00 -5.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.0 & 1.0 & 1.7\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}0.5 & 1.0 & 1.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.0 & 5.0 & 1.0\end{bmatrix}$, what is P's color?

98. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 1) in a 749 x 421 image with the following parameters? l=1, r=4, b=1, t=4 view type = orthographic camera origin = $\begin{bmatrix}-3.0 & 0.0 & 3.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.87 & 0.44 & 0.22\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.17 & -0.51 & -0.85\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.0 & 0.51 & -0.86\end{bmatrix}$

99. What are the A, B, and C components of the line passing through $\begin{bmatrix}3.0 & -2.0 & -3.0\end{bmatrix}$ and $\begin{bmatrix}-2.0 & -5.0 & 2.0\end{bmatrix}$, where Ax + By + C = 0

100. Ray R has starting point e=$\begin{bmatrix}-5.32 & -9.79 & -4.82\end{bmatrix}$ and direction d=$\begin{bmatrix}0.7 & 0.7 & -0.14\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}1.66 & -1.46 & -5.4\end{bmatrix}\begin{bmatrix}0.1 & -4.72 & -6.11\end{bmatrix}\begin{bmatrix}-4.14 & -9.67 & -5.69\end{bmatrix}\begin{bmatrix}-3.29 & -2.17 & -1.87\end{bmatrix}$[
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?

101. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 1) in a 734 x 463 image with the following parameters? l=-3, r=-1, b=-3, t=-2 view type = orthographic camera origin = $\begin{bmatrix}2.0 & 2.0 & -4.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.45 & -0.89 & 0.0\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.18 & -0.91 & -0.37\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.74 & 0.37 & 0.56\end{bmatrix}$

102. Ray R has starting point e=$\begin{bmatrix}6.83 & 5.32 & 2.87\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.74 & -0.56 & -0.37\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}6.47 & 3.62 & 3.93\end{bmatrix}\begin{bmatrix}1.84 & 6.39 & -2.55\end{bmatrix}\begin{bmatrix}4.77 & 3.77 & 1.77\end{bmatrix}\begin{bmatrix}4.31 & 5.16 & 0.85\end{bmatrix}\begin{bmatrix}6.31 & 2.2$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection 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, 0) in a 636 x 721 image with the following parameters? l=-5, r=1, b=-5, t=-1 view type = orthographic camera origin = $\begin{bmatrix}-1.0 & -4.0 & -3.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.51 & -0.17 & -0.85\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.89 & 0.45 & 0.0\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.7 & -0.7 & -0.14\end{bmatrix}$

104. What are the barycentric coordinates of point P=$\begin{bmatrix}-10.12 & -0.61 & 1.0\end{bmatrix}$ with respect to triangle T with vertices -5.00 -1.00 -3.00 -4.00 2.00 -5.00 4.00 -2.00 1.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.7 & 1.7 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}2.0 & 0.0 & 1.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}0.3 & 0.7 & 1.0\end{bmatrix}$, what is P's color?

105. Triangle T has vertices p0=$\begin{bmatrix}2.33 & -6.33 & -2.0\end{bmatrix}$, p1=$\begin{bmatrix}4.0 & -8.0 & -2.0\end{bmatrix}$, p2=$\begin{bmatrix}5.0 & -7.67 & 0.67\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}1.45 & -8.45 & 2.17\end{bmatrix}$ and direction d=$\begin{bmatrix}0.7 & 0.17 & -0.7\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

106. What are the barycentric coordinates of point P=$\begin{bmatrix}-0.58 & 1.66 & 0.71\end{bmatrix}$ with respect to triangle T with vertices -4.00 0.00 0.00 4.00 3.00 1.00 -4.00 4.00 3.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.2 & 0.8 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}0.8 & 0.5 & 1.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.0 & 1.2 & 1.2\end{bmatrix}$, what is P's color?

107. Ray R has starting point e=$\begin{bmatrix}-3.35 & -3.41 & 3.64\end{bmatrix}$ and direction d=$\begin{bmatrix}0.87 & 0.44 & 0.22\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-6.12 & -0.88 & 6.12\end{bmatrix}\begin{bmatrix}-1.17 & -0.88 & 6.12\end{bmatrix}\begin{bmatrix}-1.88 & -4.41 & 2.59\end{bmatrix}\begin{bmatrix}-4.71 & -4.41 & 2.59\end{bmatrix}\begin{bmatrix}-$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

108. What are the barycentric coordinates of point P=$\begin{bmatrix}1.68 & 0.53 & 1.01\end{bmatrix}$ with respect to triangle T with vertices 1.00 1.00 2.00 1.00 -2.00 0.00 4.00 1.00 -1.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}3.0 & 1.0 & 4.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}0.0 & 0.7 & 1.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}4.0 & 1.0 & 5.0\end{bmatrix}$, what is P's color?

109. Triangle T has vertices p0=$\begin{bmatrix}1.73 & -6.62 & -1.89\end{bmatrix}$, p1=$\begin{bmatrix}-2.89 & -1.42 & -1.31\end{bmatrix}$, p2=$\begin{bmatrix}1.15 & -1.42 & 2.73\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-6.61 & -7.63 & 0.27\end{bmatrix}$ and direction d=$\begin{bmatrix}0.7 & 0.7 & 0.14\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?

c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

110. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 0) in a 456 x 644 image with the following parameters? l=-3, r=2, b=-4, t=-3 view type = orthographic camera origin = $\begin{bmatrix}-4.0 & 2.0 & 2.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.66 & 0.53 & -0.53\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.42 & -0.57 & -0.71\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.3 & -0.3 & -0.9\end{bmatrix}$

111. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 3) in a 289 x 460 image with the following parameters? l=3, r=4, b=-5, t=2 view type = perspective camera origin = $\begin{bmatrix}2.0 & 2.0 & 4.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.44 & 0.87 & 0.22\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.32 & -0.81 & -0.49\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.43 & -0.64 & -0.64\end{bmatrix}$

112. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 2) in a 403 x 253 image with the following parameters? l=-3, r=-2, b=-5, t=0 view type = perspective camera origin = $\begin{bmatrix}-3.0 & 1.0 & 4.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.71 & 0.71 & 0.0\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.47 & -0.62 & 0.62\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.71 & 0.71 & 0.0\end{bmatrix}$

113. Triangle T has vertices p0=$\begin{bmatrix}-3.85 & -5.89 & 2.04\end{bmatrix}$, p1=$\begin{bmatrix}-5.0 & 0.46 & -5.46\end{bmatrix}$, p2=$\begin{bmatrix}-2.11 & -3.0 & 0.89\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-5.06 & -1.1 & -3.81\end{bmatrix}$ and direction d=$\begin{bmatrix}0.8 & 0.6 & -0.0\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

114. What are the A, B, and C components of the line passing through $\begin{bmatrix}4.0 & 0.0 & 3.0\end{bmatrix}$ and $\begin{bmatrix}1.0 & -4.0 & 1.0\end{bmatrix}$, where Ax + By + C = 0

115. Ray R has starting point e=$\begin{bmatrix}-16.13 & -3.1 & 2.74\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.27 & -0.53 & -0.8\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-0.08 & -7.2 & 4.92\end{bmatrix}\begin{bmatrix}-7.12 & -4.64 & 7.05\end{bmatrix}\begin{bmatrix}-2.64 & -4.0 & 3.43\end{bmatrix}\begin{bmatrix}-2.0 & -6.13 & 5.13\end{bmatrix}[$
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?

116. Ray R has starting point e=$\begin{bmatrix}-7.62 & -2.46 & -0.29\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.83 & -0.0 & 0.55\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-0.94 & -6.43 & -1.11\end{bmatrix}\begin{bmatrix}-5.06 & 0.43 & -1.11\end{bmatrix}\begin{bmatrix}-4.03 & -1.29 & -6.77\end{bmatrix}[-4.54 \quad -0.43$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

117. Triangle T has vertices p0=$\begin{bmatrix}7.0 & -5.33 & -1.33\end{bmatrix}$, p1=$\begin{bmatrix}6.0 & -7.33 & 0.67\end{bmatrix}$, p2=$\begin{bmatrix}4.67 & -4.67 & 0.67\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}2.49 & -3.1 & -0.7\end{bmatrix}$ and direction d=$\begin{bmatrix}0.86 & -0.51 & -0.0\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

118. What are the A, B, and C components of the line passing through $\begin{bmatrix}1.0 & -4.0 & 2.0\end{bmatrix}$ and $\begin{bmatrix}1.0 & -4.0 & -1.0\end{bmatrix}$, where Ax + By + C = 0

119. What are the barycentric coordinates of point P=$\begin{bmatrix}-2.6 & -2.07 & -2.52\end{bmatrix}$ with respect to triangle T with vertices 1.00 3.00 1.00 -4.00 -3.00 -5.00 -2.00 -3.00 0.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.0 & 4.0 & 5.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}0.0 & 0.8 & 1.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.0 & 0.8 & 1.0\end{bmatrix}$, what is P's color?

120. What are the barycentric coordinates of point P=$\begin{bmatrix}-4.56 & -3.18 & 0.5\end{bmatrix}$ with respect to triangle T with vertices -4.00 1.00 -2.00 -4.00 -4.00 -4.00 -5.00 -5.00 3.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}0.5 & 1.0 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}0.0 & 1.0 & 1.3\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}0.7 & 1.0 & 1.7\end{bmatrix}$, what is P's color?

121. Triangle T has vertices p0=$\begin{bmatrix}-0.71 & 4.12 & -0.12\end{bmatrix}$, p1=$\begin{bmatrix}0.0 & 2.0 & 2.0\end{bmatrix}$, p2=$\begin{bmatrix}-2.83 & 4.12 & -0.12\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-2.23 & 0.32 & 3.68\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.0 & 0.71 & -0.71\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

122. What are the barycentric coordinates of point P=$\begin{bmatrix}-4.54 & 2.58 & 1.0\end{bmatrix}$ with respect to triangle T with vertices 2.00 -1.00 4.00 3.00 4.00 -2.00 -3.00 -1.00 -3.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}3.0 & 1.0 & 5.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 0.5 & 0.5\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.0 & 1.5 & 1.0\end{bmatrix}$, what is P's color?

123. What are the A, B, and C components of the line passing through $\begin{bmatrix}4.0 & 3.0 & 0.0\end{bmatrix}$ and $\begin{bmatrix}-4.0 & 4.0 & 2.0\end{bmatrix}$, where Ax + By + C = 0

124. Triangle T has vertices p0=$\begin{bmatrix}0.0 & -1.77 & -7.77\end{bmatrix}$, p1=$\begin{bmatrix}2.57 & 3.37 & -6.06\end{bmatrix}$, p2=$\begin{bmatrix}0.51 & 0.11 & -6.57\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-2.16 & -2.41 & -8.74\end{bmatrix}$ and direction d=$\begin{bmatrix}0.71 & 0.57 & 0.42\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

125. Ray R has starting point e=$\begin{bmatrix}-1.6 & 2.94 & -2.78\end{bmatrix}$ and direction d=$\begin{bmatrix}0.69 & 0.69 & 0.23\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-2.04 & 4.22 & -4.86\end{bmatrix}\begin{bmatrix}0.82 & 3.41 & 0.04\end{bmatrix}\begin{bmatrix}-0.41 & 3.82 & -2.0\end{bmatrix}\begin{bmatrix}-2.04 & 8.31 & -0.78\end{bmatrix}\begin{bmatrix}2.04$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

126. What are the A, B, and C components of the line passing through $\begin{bmatrix}1.0 & 2.0 & -2.0\end{bmatrix}$ and $\begin{bmatrix}3.0 & 1.0 & 0.0\end{bmatrix}$, where Ax + By + C = 0

127. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 3) in a 641 x 749 image with the following parameters? l=-5, r=3, b=-5, t=3 view type = perspec-

tive camera origin = $\begin{bmatrix}3.0 & 2.0 & 2.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.37 & -0.93 & 0.0\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.0 & -0.55 & -0.83\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.53 & -0.66 & 0.53\end{bmatrix}$

128. What are the A, B, and C components of the line passing through $\begin{bmatrix}1.0 & 0.0 & 2.0\end{bmatrix}$ and $\begin{bmatrix}-2.0 & 0.0 & -2.0\end{bmatrix}$, where Ax + By + C = 0

129. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 0) in a 397 x 574 image with the following parameters? l=-2, r=-1, b=2, t=3 view type = orthographic camera origin = $\begin{bmatrix}-3.0 & -4.0 & 3.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.47 & -0.62 & 0.62\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.2 & -0.78 & 0.59\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.59 & -0.2 & -0.78\end{bmatrix}$

130. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 3) in a 504 x 431 image with the following parameters? l=-1, r=0, b=-1, t=1 view type = perspective camera origin = $\begin{bmatrix}-1.0 & 4.0 & 2.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.0 & -0.62 & -0.78\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.67 & -0.33 & -0.67\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.68 & 0.27 & -0.68\end{bmatrix}$

131. What are the A, B, and C components of the line passing through $\begin{bmatrix}-5.0 & 0.0 & 0.0\end{bmatrix}$ and $\begin{bmatrix}1.0 & 3.0 & -5.0\end{bmatrix}$, where Ax + By + C = 0

132. Triangle T has vertices p0=$\begin{bmatrix}-2.22 & 4.22 & -0.78\end{bmatrix}$, p1=$\begin{bmatrix}-3.04 & 0.96 & -2.0\end{bmatrix}$, p2=$\begin{bmatrix}-0.59 & 2.59 & -2.41\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-1.14 & 0.87 & -1.57\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.44 & 0.87 & -0.22\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

133. What are the barycentric coordinates of point P=$\begin{bmatrix}-8.91 & -0.23 & 1.0\end{bmatrix}$ with respect to triangle T with vertices -5.00 -1.00 1.00 2.00 -4.00 -3.00 0.00 3.00 3.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}0.0 & 1.0 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 0.5 & 0.8\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}0.8 & 0.0 & 1.0\end{bmatrix}$, what is P's color?

134. Triangle T has vertices p0=$\begin{bmatrix}2.93 & 4.64 & 0.44\end{bmatrix}$, p1=$\begin{bmatrix}4.64 & 4.21 & 3.64\end{bmatrix}$, p2=$\begin{bmatrix}1.65 & 2.08 & 2.36\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-0.39 & 4.1 & 1.06\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.7 & 0.17 & -0.7\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

135. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 0) in a 254 x 495 image with the following parameters? l=-3, r=0, b=-3, t=-2 view type = orthographic camera origin = $\begin{bmatrix}2.0 & -2.0 & -4.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.53 & -0.53 & -0.66\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.0 & 0.0 & 1.0\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.71 & 0.0 & 0.71\end{bmatrix}$

136. What are the A, B, and C components of the line passing through $\begin{bmatrix}0.0 & -1.0 & 2.0\end{bmatrix}$ and $\begin{bmatrix}3.0 & 4.0 & -4.0\end{bmatrix}$, where Ax + By + C = 0

137. What are the A, B, and C components of the line passing through $\begin{bmatrix}3.0 & 4.0 & 0.0\end{bmatrix}$ and $\begin{bmatrix}0.0 & 3.0 & -1.0\end{bmatrix}$, where Ax + By + C = 0

138. Triangle T has vertices p0=$\begin{bmatrix}4.0 & 4.0 & -5.0\end{bmatrix}$, p1=$\begin{bmatrix}8.62 & 6.89 & -3.27\end{bmatrix}$, p2=$\begin{bmatrix}4.0 & 5.15 & -6.15\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}6.93 & 5.71 & -3.87\end{bmatrix}$ and direction d=$\begin{bmatrix}0.7 & 0.7 & 0.17\end{bmatrix}$.

b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

139. What are the barycentric coordinates of point P=$\begin{bmatrix}-1.78 & -0.14 & -1.48\end{bmatrix}$ with respect to triangle T with vertices -4.00 -3.00 -3.00 -1.00 1.00 -1.00 1.00 -1.00 2.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.0 & 0.8 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.7 & 0.3 & 1.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.7 & 1.0 & 1.3\end{bmatrix}$, what is P's color?

140. What are the A, B, and C components of the line passing through $\begin{bmatrix}0.0 & -3.0 & -5.0\end{bmatrix}$ and $\begin{bmatrix}-4.0 & -1.0 & -3.0\end{bmatrix}$, where Ax + By + C = 0

141. Triangle T has vertices p0=$\begin{bmatrix}-0.1 & -4.02 & 4.73\end{bmatrix}$, p1=$\begin{bmatrix}-0.7 & -4.32 & 3.22\end{bmatrix}$, p2=$\begin{bmatrix}0.21 & -0.7 & 2.32\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}0.84 & -1.46 & 1.7\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.53 & -0.27 & 0.8\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

142. Triangle T has vertices p0=$\begin{bmatrix}1.2 & -1.6 & -1.8\end{bmatrix}$, p1=$\begin{bmatrix}1.4 & -1.6 & -1.8\end{bmatrix}$, p2=$\begin{bmatrix}0.8 & -2.8 & -3.4\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}3.15 & -0.69 & -1.04\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.73 & -0.49 & -0.49\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

143. Triangle T has vertices p0=$\begin{bmatrix}-7.12 & 7.54 & 0.54\end{bmatrix}$, p1=$\begin{bmatrix}-6.41 & 6.83 & -0.17\end{bmatrix}$, p2=$\begin{bmatrix}-2.88 & 1.17 & -5.83\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-13.25 & 1.83 & 1.03\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.53 & -0.27 & -0.8\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

144. Triangle T has vertices p0=$\begin{bmatrix}-1.1 & -0.1 & -1.29\end{bmatrix}$, p1=$\begin{bmatrix}1.28 & 2.28 & 5.83\end{bmatrix}$, p2=$\begin{bmatrix}-1.1 & 0.09 & -0.37\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-1.25 & 0.95 & 3.47\end{bmatrix}$ and direction d=$\begin{bmatrix}0.6 & -0.0 & -0.8\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

145. What are the A, B, and C components of the line passing through $\begin{bmatrix}-1.0 & -3.0 & -4.0\end{bmatrix}$ and $\begin{bmatrix}3.0 & 3.0 & -3.0\end{bmatrix}$, where Ax + By + C = 0

146. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 1) in a 726 x 304 image with the following parameters? l=-4, r=3, b=-5, t=0 view type = perspective camera origin = $\begin{bmatrix}-3.0 & 3.0 & 1.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.85 & 0.17 & 0.51\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.8 & -0.6 & 0.0\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.71 & 0.0 & -0.71\end{bmatrix}$

147. What are the A, B, and C components of the line passing through $\begin{bmatrix}-5.0 & 3.0 & -5.0\end{bmatrix}$ and $\begin{bmatrix}2.0 & 1.0 & 3.0\end{bmatrix}$, where Ax + By + C = 0

148. Triangle T has vertices p0=$\begin{bmatrix}2.0 & 5.0 & -3.0\end{bmatrix}$, p1=$\begin{bmatrix}2.0 & 4.0 & 6.0\end{bmatrix}$, p2=$\begin{bmatrix}2.0 & 2.0 & 4.0\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}0.27 & 6.59 & -3.23\end{bmatrix}$ and direction d=$\begin{bmatrix}0.17 & -0.51 & 0.85\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

149. Triangle T has vertices p0=$\begin{bmatrix}-1.36 & -2.24 & 4.3\end{bmatrix}$, p1=$\begin{bmatrix}-0.41 & -1.29 & -0.41\end{bmatrix}$, p2=$\begin{bmatrix}5.01 & -1.76 & -3.95\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-9.57 & -0.81 & -0.25\end{bmatrix}$ and direction d=$\begin{bmatrix}0.81 & -0.32 & 0.49\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

150. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 3) in a 722 x 367 image with the following parameters? l=-2, r=1, b=-4, t=4 view type = perspective camera origin = $\begin{bmatrix}-4.0 & -4.0 & 0.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.37 & 0.18 & -0.91\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.0 & -0.71 & 0.71\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.6 & 0.8 & 0.0\end{bmatrix}$

151. What are the barycentric coordinates of point P=$\begin{bmatrix}-0.94 & -1.79 & 3.55\end{bmatrix}$ with respect to triangle T with vertices -1.00 -2.00 4.00 0.00 2.00 -5.00 2.00 2.00 1.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}0.8 & 1.0 & 0.5\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}0.7 & 0.0 & 1.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.0 & 2.5 & 2.0\end{bmatrix}$, what is P's color?

152. What are the barycentric coordinates of point P=$\begin{bmatrix}-4.21 & -2.9 & 1.0\end{bmatrix}$ with respect to triangle T with vertices 1.00 -3.00 -5.00 2.00 1.00 -5.00 3.00 -3.00 -5.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.0 & 1.0 & 5.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}0.5 & 1.0 & 0.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}2.0 & 1.5 & 1.0\end{bmatrix}$, what is P's color?

153. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 4) in a 252 x 403 image with the following parameters? l=-5, r=-1, b=-4, t=-2 view type = perspective camera origin = $\begin{bmatrix}-5.0 & -2.0 & -5.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.68 & -0.68 & 0.27\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.89 & 0.45 & 0.0\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.18 & 0.37 & -0.91\end{bmatrix}$

154. Ray R has starting point e=$\begin{bmatrix}1.72 & 0.49 & -0.96\end{bmatrix}$ and direction d=$\begin{bmatrix}0.86 & 0.51 & -0.0\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}1.38 & 4.38 & -0.84\end{bmatrix}\begin{bmatrix}3.67 & -1.13 & -1.29\end{bmatrix}\begin{bmatrix}0.92 & -1.13 & 1.46\end{bmatrix}\begin{bmatrix}-0.23 & 0.25 & 2.15\end{bmatrix}\begin{bmatrix}2.06$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

155. Ray R has starting point e=$\begin{bmatrix}-6.84 & -7.1 & -1.78\end{bmatrix}$ and direction d=$\begin{bmatrix}0.51 & 0.85 & -0.17\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-1.59 & -2.79 & 1.21\end{bmatrix}\begin{bmatrix}-5.51 & -5.51 & -3.02\end{bmatrix}\begin{bmatrix}-7.62 & -4.6 & 1.81\end{bmatrix}\begin{bmatrix}-3.7 & -3.4 & 1.51$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection 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. Ray R has starting point e=$\begin{bmatrix}-2.27 & 1.81 & 1.4\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.53 & -0.8 & -0.27\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}0.75 & -2.81 & -1.13\end{bmatrix}\begin{bmatrix}5.12 & -0.78 & 0.12\end{bmatrix}\begin{bmatrix}2.0 & 1.41 & -4.41\end{bmatrix}\begin{bmatrix}1.38 & -0.94 & -2.53\end{bmatrix}\begin{bmatrix}-1.12$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

157. Triangle T has vertices p0=$\begin{bmatrix}-3.2 & 2.2 & -0.4\end{bmatrix}$, p1=$\begin{bmatrix}-4.4 & -4.6 & 1.2\end{bmatrix}$, p2=$\begin{bmatrix}-5.0 & 1.0 & 2.0\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-11.61 & -0.52 & 1.0\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.71 & -0.71 & -0.0\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

158. Ray R has starting point e=$\begin{bmatrix}5.84 & -1.0 & -1.86\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.6 & 0.75 & -0.3\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}4.0 & 4.0 & 1.0\end{bmatrix}\begin{bmatrix}4.0 & -1.0 & -7.0\end{bmatrix}\begin{bmatrix}4.0 & 3.0 & 1.0\end{bmatrix}\begin{bmatrix}4.0 & 2.0 & 1.0\end{bmatrix}\begin{bmatrix}4.0 & 3.0 & 1.0\end{bmatrix}$.
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?

159. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 3) in a 442 x 324 image with the following parameters? l=-4, r=-3, b=-2, t=4 view type = orthographic camera origin = $\begin{bmatrix}1.0 & -1.0 & 1.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.22 & 0.44 & 0.87\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.67 & 0.67 & -0.33\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.33 & -0.67 & 0.67\end{bmatrix}$

160. Triangle T has vertices p0=$\begin{bmatrix}2.41 & 5.41 & 5.12\end{bmatrix}$, p1=$\begin{bmatrix}-1.83 & 1.17 & 3.71\end{bmatrix}$, p2=$\begin{bmatrix}-0.41 & 2.59 & -0.54\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-11.59 & 0.66 & 1.52\end{bmatrix}$ and direction d=$\begin{bmatrix}0.58 & 0.58 & -0.58\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

161. What are the A, B, and C components of the line passing through $\begin{bmatrix}-1.0 & -1.0 & -3.0\end{bmatrix}$ and $\begin{bmatrix}-5.0 & 4.0 & 1.0\end{bmatrix}$, where Ax + By + C = 0

162. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 0) in a 504 x 688 image with the following parameters? l=-5, r=4, b=-5, t=-1 view type = perspective camera origin = $\begin{bmatrix}1.0 & 2.0 & 3.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.0 & 0.45 & -0.89\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.71 & -0.71 & 0.0\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.0 & -0.83 & -0.55\end{bmatrix}$

163. What are the barycentric coordinates of point P=$\begin{bmatrix}-4.54 & -2.87 & -2.08\end{bmatrix}$ with respect to triangle T with vertices 4.00 -4.00 4.00 -5.00 -4.00 -3.00 -5.00 0.00 -1.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}5.0 & 1.0 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 2.0 & 1.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}0.5 & 1.0 & 0.0\end{bmatrix}$, what is P's color?

164. Triangle T has vertices p0=$\begin{bmatrix}1.17 & -2.88 & 5.83\end{bmatrix}$, p1=$\begin{bmatrix}5.41 & -7.12 & 1.59\end{bmatrix}$, p2=$\begin{bmatrix}6.83 & -5.0 & 0.17\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-8.53 & -5.87 & 0.91\end{bmatrix}$ and direction d=$\begin{bmatrix}0.53 & -0.27 & 0.8\end{bmatrix}$.

b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

165. What are the A, B, and C components of the line passing through $\begin{bmatrix}-4.0 & -1.0 & -1.0\end{bmatrix}$ and $\begin{bmatrix}-4.0 & 3.0 & 4.0\end{bmatrix}$, where Ax + By + C = 0

166. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 4) in a 250 x 477 image with the following parameters? l=-4, r=2, b=-2, t=0 view type = perspective camera origin = $\begin{bmatrix}-5.0 & 0.0 & 4.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.24 & -0.24 & 0.94\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.71 & -0.71 & 0.0\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.67 & 0.33 & 0.67\end{bmatrix}$

167. Triangle T has vertices p0=$\begin{bmatrix}0.09 & -5.35 & -3.79\end{bmatrix}$, p1=$\begin{bmatrix}-2.35 & -4.65 & -4.48\end{bmatrix}$, p2=$\begin{bmatrix}1.13 & -6.04 & -4.48\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-4.13 & -5.23 & 0.85\end{bmatrix}$ and direction d=$\begin{bmatrix}0.6 & 0.3 & 0.75\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

168. Triangle T has vertices p0=$\begin{bmatrix}-6.86 & 4.22 & -5.08\end{bmatrix}$, p1=$\begin{bmatrix}-4.82 & 3.82 & -1.0\end{bmatrix}$, p2=$\begin{bmatrix}-8.76 & 7.49 & -1.68\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-9.73 & 0.0 & 0.33\end{bmatrix}$ and direction d=$\begin{bmatrix}0.42 & 0.71 & -0.57\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) 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 (0, 0) in a 251 x 498 image with the following parameters? l=2, r=4, b=-5, t=-2 view type = orthographic camera origin = $\begin{bmatrix}1.0 & -4.0 & -2.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.89 & 0.0 & -0.45\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.69 & 0.51 & -0.51\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.45 & -0.89 & 0.0\end{bmatrix}$

170. What are the A, B, and C components of the line passing through $\begin{bmatrix}-5.0 & 3.0 & -1.0\end{bmatrix}$ and $\begin{bmatrix}-4.0 & -1.0 & 1.0\end{bmatrix}$, where Ax + By + C = 0

171. Triangle T has vertices p0=$\begin{bmatrix}-1.27 & 7.68 & 2.0\end{bmatrix}$, p1=$\begin{bmatrix}-1.11 & 7.03 & 1.84\end{bmatrix}$, p2=$\begin{bmatrix}0.84 & 4.6 & 3.46\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}1.42 & 7.15 & -1.14\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.6 & -0.0 & 0.8\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

172. Ray R has starting point e=$\begin{bmatrix}-15.34 & -6.43 & 3.36\end{bmatrix}$ and direction d=$\begin{bmatrix}0.81 & 0.32 & -0.49\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-1.51 & -6.4 & -1.14\end{bmatrix}\begin{bmatrix}-3.06 & -5.89 & 1.43\end{bmatrix}\begin{bmatrix}0.03 & -6.92 & -3.71\end{bmatrix}\begin{bmatrix}1.57 & -5.54 & -6.$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

173. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 2) in a 302 x 486 image with the following parameters? l=-5, r=3, b=1, t=4 view type = perspective camera origin = $\begin{bmatrix}4.0 & -2.0 & 1.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.87 & 0.22 & 0.44\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.75 & -0.6 & -0.3\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.19 & -0.96 & 0.19\end{bmatrix}$

174. What are the barycentric coordinates of point P=$\begin{bmatrix}-10.44 & -3.99 & 1.0\end{bmatrix}$ with respect to triangle T with vertices 2.00 -4.00 -1.00 1.00 1.00 -1.00 -5.00 0.00 2.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.0 & 0.5 & 0.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 1.0 & 2.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.0 & 2.0 & 1.5\end{bmatrix}$, what is P's color?

175. What are the A, B, and C components of the line passing through $\begin{bmatrix}-4.0 & 3.0 & -1.0\end{bmatrix}$ and $\begin{bmatrix}1.0 & 1.0 & 0.0\end{bmatrix}$, where Ax + By + C = 0

176. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 0) in a 537 x 714 image with the following parameters? l=0, r=4, b=-5, t=3 view type = orthographic camera origin = $\begin{bmatrix}2.0 & 2.0 & -1.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.0 & -0.32 & -0.95\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.49 & -0.81 & -0.32\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.78 & -0.59 & -0.2\end{bmatrix}$

177. What are the barycentric coordinates of point P=$\begin{bmatrix}-3.44 & -3.93 & 1.0\end{bmatrix}$ with respect to triangle T with vertices 3.00 4.00 -2.00 2.00 -4.00 -4.00 0.00 0.00 -4.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}4.0 & 1.0 & 5.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 0.8 & 0.8\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.0 & 0.2 & 0.2\end{bmatrix}$, what is P's color?

178. What are the A, B, and C components of the line passing through $\begin{bmatrix}4.0 & 3.0 & 4.0\end{bmatrix}$ and $\begin{bmatrix}-3.0 & 3.0 & 4.0\end{bmatrix}$, where Ax + By + C = 0

179. Triangle T has vertices p0=$\begin{bmatrix}-2.25 & -0.56 & -0.5\end{bmatrix}$, p1=$\begin{bmatrix}-0.38 & 1.78 & -7.22\end{bmatrix}$, p2=$\begin{bmatrix}0.87 & 3.34 & -1.28\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}0.62 & 2.44 & -2.34\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.8 & -0.53 & 0.27\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

180. What are the A, B, and C components of the line passing through $\begin{bmatrix}2.0 & 2.0 & 0.0\end{bmatrix}$ and $\begin{bmatrix}2.0 & 2.0 & 4.0\end{bmatrix}$, where Ax + By + C = 0

181. Ray R has starting point e=$\begin{bmatrix}1.39 & -7.08 & -2.95\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.24 & -0.24 & -0.94\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}2.1 & -7.83 & -3.91\end{bmatrix}\begin{bmatrix}-0.82 & -8.2 & -4.64\end{bmatrix}\begin{bmatrix}1.56 & -4.37 & -2.63\end{bmatrix}\begin{bmatrix}-1.18 & -1.63 & -2$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection 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. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 0) in a 555 x 295 image with the following parameters? l=-4, r=0, b=-1, t=0 view type = perspective camera origin = $\begin{bmatrix}-4.0 & 2.0 & 3.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.24 & 0.0 & -0.97\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.9 & -0.3 & 0.3\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.71 & 0.57 & -0.42\end{bmatrix}$

183. Triangle T has vertices p0=$\begin{bmatrix}1.2 & -4.71 & -0.49\end{bmatrix}$, p1=$\begin{bmatrix}-3.26 & -1.37 & 1.0\end{bmatrix}$, p2=$\begin{bmatrix}-0.66 & -4.34 & -1.23\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-9.58 & -5.55 & 2.1\end{bmatrix}$ and direction d=$\begin{bmatrix}0.27 & 0.8 & -0.53\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

184. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 1) in a 684 x 328 image with the following parameters? l=-4, r=3, b=-5, t=-1 view type = orthographic camera origin = $\begin{bmatrix}2.0 & -1.0 & 1.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.33 & 0.67 & -0.67\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.0 & 0.97 & 0.24\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.82 & -0.41 & -0.41\end{bmatrix}$

185. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 1) in a 696 x 502 image with the following parameters? l=-2, r=1, b=-3, t=0 view type = orthographic camera origin = $\begin{bmatrix}1.0 & 3.0 & 0.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.43 & -0.64 & 0.64\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.24 & -0.24 & -0.94\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.57 & -0.42 & -0.71\end{bmatrix}$

186. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 4) in a 512 x 710 image with the following parameters? l=0, r=1, b=-3, t=3 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 = $\begin{bmatrix}0.62 & 0.0 & -0.78\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.73 & 0.49 & 0.49\end{bmatrix}$

187. Ray R has starting point e=$\begin{bmatrix}-7.77 & 1.11 & 0.03\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.3 & -0.9 & 0.3\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-3.58 & -0.11 & 2.45\end{bmatrix}\begin{bmatrix}1.79 & 1.68 & 3.34\end{bmatrix}\begin{bmatrix}-1.34 & 0.79 & 2.89\end{bmatrix}\begin{bmatrix}-3.13 & -3.68 & 0.66\end{bmatrix}\begin{bmatrix}-3.13 & 1.6$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

188. What are the barycentric coordinates of point P=$\begin{bmatrix}-4.93 & 1.53 & 1.0\end{bmatrix}$ with respect to triangle T with vertices -3.00 -3.00 0.00 0.00 2.00 0.00 -1.00 0.00 -4.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.0 & 2.5 & 2.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 1.0 & 0.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.0 & 1.0 & 0.7\end{bmatrix}$, what is P's color?

189. What are the barycentric coordinates of point P=$\begin{bmatrix}-12.93 & 0.23 & 1.0\end{bmatrix}$ with respect to triangle T with vertices -3.00 0.00 -4.00 2.00 0.00 4.00 -5.00 1.00 2.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}0.0 & 0.0 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 1.2 & 1.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.0 & 0.5 & 0.0\end{bmatrix}$, what is P's color?

190. What are the A, B, and C components of the line passing through $\begin{bmatrix}-4.0 & -3.0 & 0.0\end{bmatrix}$ and $\begin{bmatrix}-2.0 & 3.0 & -5.0\end{bmatrix}$, where Ax + By + C = 0

191. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 4) in a 678 x 668 image with the following parameters? l=-3, r=3, b=2, t=3 view type = orthographic camera origin = $\begin{bmatrix}0.0 & 4.0 & 3.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.0 & -0.89 & -0.45\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.17 & 0.7 & 0.7\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.18 & -0.91 & 0.37\end{bmatrix}$

192. Ray R has starting point e=$\begin{bmatrix}-3.02 & 2.38 & 5.05\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.67 & -0.33 & -0.67\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-7.58 & 2.0 & 1.0\end{bmatrix}\begin{bmatrix}-6.12 & 1.27 & 3.91\end{bmatrix}\begin{bmatrix}0.91 & 1.03 & 4.88\end{bmatrix}\begin{bmatrix}0.67 & 0.79 & 5.85\end{bmatrix}\begin{bmatrix}-2.0 & 1.2$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

193. Ray R has starting point e=$\begin{bmatrix}-7.82 & 0.17 & 1.0\end{bmatrix}$ and direction d=$\begin{bmatrix}-1.0 & -0.0 & -0.0\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-3.49 & 3.4 & 3.71\end{bmatrix}\begin{bmatrix}-5.54 & -2.77 & 0.29\end{bmatrix}\begin{bmatrix}-5.03 & -3.97 & -1.6\end{bmatrix}\begin{bmatrix}-1.43 & 0.83 & -1.6\end{bmatrix}\begin{bmatrix}-1.4$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection 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 A, B, and C components of the line passing through $\begin{bmatrix}-4.0 & 0.0 & 1.0\end{bmatrix}$ and $\begin{bmatrix}4.0 & -2.0 & -3.0\end{bmatrix}$, where Ax + By + C = 0

195. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 2) in a 680 x 736 image with the following parameters? l=1, r=2, b=-4, t=0 view type = orthographic camera origin = $\begin{bmatrix}3.0 & -5.0 & 1.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.6 & -0.8 & 0.0\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.67 & 0.33 & -0.67\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.86 & 0.51 & 0.0\end{bmatrix}$

196. Ray R has starting point e=$\begin{bmatrix}-15.77 & 0.74 & 1.0\end{bmatrix}$ and direction d=$\begin{bmatrix}0.71 & 0.71 & -0.0\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-2.81 & 3.23 & 6.97\end{bmatrix}\begin{bmatrix}-0.03 & 3.23 & 1.4\end{bmatrix}\begin{bmatrix}-2.63 & 0.26 & 2.14\end{bmatrix}\begin{bmatrix}-0.4 & 3.97 & 3.26\end{bmatrix}\begin{bmatrix}-5.41 & -0$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection 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. Triangle T has vertices p0=$\begin{bmatrix}-0.89 & 2.02 & -3.79\end{bmatrix}$, p1=$\begin{bmatrix}0.45 & 0.68 & -1.11\end{bmatrix}$, p2=$\begin{bmatrix}0.89 & -2.0 & -0.21\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-2.12 & 1.26 & -3.35\end{bmatrix}$ and direction d=$\begin{bmatrix}0.74 & -0.37 & 0.56\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

198. Ray R has starting point e=$\begin{bmatrix}1.24 & -5.39 & 0.52\end{bmatrix}$ and direction d=$\begin{bmatrix}0.94 & -0.24 & -0.24\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}1.84 & -8.33 & 1.73\end{bmatrix}\begin{bmatrix}3.22 & -7.55 & 1.14\end{bmatrix}\begin{bmatrix}8.51 & -2.25 & -4.16\end{bmatrix}\begin{bmatrix}2.82 & -3.23 & -4.75\end{bmatrix}\begin{bmatrix}$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

199. What are the A, B, and C components of the line passing through $\begin{bmatrix}-5.0 & -4.0 & 2.0\end{bmatrix}$ and $\begin{bmatrix}-1.0 & -4.0 & 0.0\end{bmatrix}$, where Ax + By + C = 0

200. Triangle T has vertices p0=$\begin{bmatrix}-2.0 & -1.0 & 4.0\end{bmatrix}$, p1=$\begin{bmatrix}-1.0 & -1.0 & -1.0\end{bmatrix}$, p2=$\begin{bmatrix}1.0 & -1.0 & -5.0\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-5.55 & -5.96 & 0.01\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.51 & 0.85 & 0.17\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

201. What are the barycentric coordinates of point P=$\begin{bmatrix}-7.39 & -0.13 & 1.0\end{bmatrix}$ with respect to triangle T with vertices -1.00 1.00 -4.00 1.00 -2.00 -4.00 -2.00 -2.00 1.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}0.7 & 0.3 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}0.5 & 1.0 & 0.8\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}4.0 & 1.0 & 3.0\end{bmatrix}$, what is P's color?

202. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 4) in a 728 x 327 image with the following parameters? l=-5, r=4, b=-2, t=0 view type = orthographic camera origin = $\begin{bmatrix}-3.0 & 4.0 & 0.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}1.0 & 0.0 & 0.0\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.0 & 0.71 & -0.71\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.0 & -0.98 & -0.2\end{bmatrix}$

203. Ray R has starting point e=$\begin{bmatrix}1.62 & 4.35 & 5.92\end{bmatrix}$ and direction d=$\begin{bmatrix}0.53 & -0.27 & -0.8\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}0.78 & 4.62 & 5.25\end{bmatrix}\begin{bmatrix}2.5 & 2.75 & 5.56\end{bmatrix}\begin{bmatrix}3.75 & 4.0 & 7.75\end{bmatrix}\begin{bmatrix}0.0 & 9.0 & 7.75\end{bmatrix}\begin{bmatrix}1.72 & 5.25 & 6.65\end{bmatrix}$.
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?

204. Triangle T has vertices p0=$\begin{bmatrix}3.93 & -6.4 & -4.84\end{bmatrix}$, p1=$\begin{bmatrix}0.0 & -5.31 & -4.62\end{bmatrix}$, p2=$\begin{bmatrix}5.24 & -3.13 & 2.36\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}5.47 & -5.69 & -0.15\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.74 & 0.56 & -0.37\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

205. Triangle T has vertices p0=$\begin{bmatrix}-2.93 & -4.37 & -5.3\end{bmatrix}$, p1=$\begin{bmatrix}-5.16 & -7.71 & -4.74\end{bmatrix}$, p2=$\begin{bmatrix}-4.41 & -5.11 & -7.16\end{bmatrix}$ Ray R has starting point e=$\begin{bmatrix}-9.45 & -5.03 & -0.7\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.32 & -0.49 & 0.81\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

206. What are the A, B, and C components of the line passing through $\begin{bmatrix}0.0 & 3.0 & -3.0\end{bmatrix}$ and $\begin{bmatrix}-1.0 & 2.0 & -4.0\end{bmatrix}$, where Ax + By + C = 0

207. Triangle T has vertices p0=$\begin{bmatrix}4.15 & -0.31 & -1.15\end{bmatrix}$, p1=$\begin{bmatrix}5.89 & 1.42 & 2.31\end{bmatrix}$, p2=$\begin{bmatrix}4.15 & 4.89 & 4.04\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}2.49 & 0.11 & 2.22\end{bmatrix}$ and direction d=$\begin{bmatrix}0.7 & 0.7 & 0.17\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

208. Triangle T has vertices p0=$\begin{bmatrix}-3.0 & 0.17 & 2.83\end{bmatrix}$, p1=$\begin{bmatrix}0.54 & 0.88 & 2.12\end{bmatrix}$, p2=$\begin{bmatrix}-2.29 & 5.12 & -2.12\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-10.45 & 0.71 & -0.93\end{bmatrix}$ and direction d=$\begin{bmatrix}0.62 & 0.15 & 0.77\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

209. What are the barycentric coordinates of point P=$\begin{bmatrix}-13.3 & -1.57 & 1.0\end{bmatrix}$ with respect to triangle T with vertices 0.00 1.00 2.00 -4.00 -2.00 3.00 0.00 4.00 -5.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.7 & 1.3 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}0.2 & 1.0 & 0.8\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}0.0 & 1.0 & 4.0\end{bmatrix}$, what is P's color?

210. Triangle T has vertices p0=$\begin{bmatrix}-0.86 & -8.09 & 2.26\end{bmatrix}$, p1=$\begin{bmatrix}1.0 & -2.33 & 3.0\end{bmatrix}$, p2=$\begin{bmatrix}1.93 & -8.27 & 3.37\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-8.46 & -5.07 & -0.37\end{bmatrix}$ and direction d=$\begin{bmatrix}0.49 & -0.49 & 0.73\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

211. Ray R has starting point e=$\begin{bmatrix}-3.24 & -3.64 & -4.36\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.67 & 0.67 & 0.33\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-0.29 & -6.92 & -3.77\end{bmatrix}\begin{bmatrix}-6.45 & -0.15 & -3.03\end{bmatrix}\begin{bmatrix}-6.2 & -2.0 & -1.8\end{bmatrix}\begin{bmatrix}-2.63 & 1.08 & -7$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

212. What are the barycentric coordinates of point P=$\begin{bmatrix}-1.95 & 3.68 & 0.95\end{bmatrix}$ with respect to triangle T with vertices -4.00 4.00 3.00 -4.00 2.00 3.00 4.00 3.00 -5.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}3.0 & 0.0 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 1.7 & 0.3\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}3.0 & 1.0 & 0.0\end{bmatrix}$, what is P's color?

213. What are the A, B, and C components of the line passing through $\begin{bmatrix}3.0 & 1.0 & 3.0\end{bmatrix}$ and $\begin{bmatrix}4.0 & 1.0 & 4.0\end{bmatrix}$, where Ax + By + C = 0

214. What are the barycentric coordinates of point P=$\begin{bmatrix}-8.04 & -1.13 & 1.0\end{bmatrix}$ with respect to triangle T with vertices -3.00 -2.00 0.00 -2.00 -2.00 -2.00 -4.00 3.00 3.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.0 & 1.7 & 0.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.5 & 0.5 & 1.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}0.2 & 0.0 & 1.0\end{bmatrix}$, what is P's color?

215. Triangle T has vertices p0=$\begin{bmatrix}5.41 & 0.71 & 2.95\end{bmatrix}$, p1=$\begin{bmatrix}3.53 & 0.0 & -3.89\end{bmatrix}$, p2=$\begin{bmatrix}4.47 & 1.65 & -1.76\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}4.28 & 0.42 & -1.54\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.73 & 0.49 & -0.49\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

216. What are the A, B, and C components of the line passing through $\begin{bmatrix}4.0 & -1.0 & 1.0\end{bmatrix}$ and $\begin{bmatrix}0.0 & -4.0 & -5.0\end{bmatrix}$, where Ax + By + C = 0

217. What are the barycentric coordinates of point P=$\begin{bmatrix}-12.88 & -2.08 & 1.0\end{bmatrix}$ with respect to triangle T with vertices 0.00 -5.00 -2.00 -1.00 -3.00 2.00 -5.00 -1.00 -5.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}0.7 & 0.7 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 4.0 & 4.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.0 & 0.0 & 0.0\end{bmatrix}$, what is P's color?

218. Triangle T has vertices p0=$\begin{bmatrix}1.77 & -5.15 & 1.69\end{bmatrix}$, p1=$\begin{bmatrix}-0.35 & 0.04 & -3.69\end{bmatrix}$, p2=$\begin{bmatrix}0.62 & -0.54 & 0.54\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-2.06 & 1.47 & -0.52\end{bmatrix}$ and direction d=$\begin{bmatrix}0.58 & -0.58 & -0.58\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

219. Ray R has starting point e=$\begin{bmatrix}-10.15 & 1.81 & 1.24\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.62 & -0.47 & -0.62\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-0.55 & -0.17 & -0.61\end{bmatrix}\begin{bmatrix}0.0 & -1.0 & 5.22\end{bmatrix}\begin{bmatrix}-2.22 & 2.33 & -0.33\end{bmatrix}\begin{bmatrix}-0.55 & -0.17 & -3.3$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

220. What are the barycentric coordinates of point P=$\begin{bmatrix}-13.33 & 2.73 & 1.0\end{bmatrix}$ with respect to triangle T with vertices -1.00 4.00 2.00 -4.00 -2.00 -2.00 -2.00 3.00 -4.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}0.8 & 0.5 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}0.0 & 5.0 & 1.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}0.2 & 1.0 & 0.8\end{bmatrix}$, what is P's color?

221. What are the barycentric coordinates of point P=$\begin{bmatrix}-4.64 & -1.35 & -0.7\end{bmatrix}$ with respect to triangle T with vertices -2.00 4.00 1.00 -2.00 3.00 2.00 -5.00 -2.00 -1.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}0.0 & 1.0 & 2.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}0.7 & 0.7 & 1.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.0 & 0.5 & 0.5\end{bmatrix}$, what is P's color?

222. What are the A, B, and C components of the line passing through $\begin{bmatrix}-1.0 & 4.0 & 4.0\end{bmatrix}$ and $\begin{bmatrix}1.0 & -3.0 & 2.0\end{bmatrix}$, where Ax + By + C = 0

223. What are the A, B, and C components of the line passing through $\begin{bmatrix}-3.0 & 1.0 & 4.0\end{bmatrix}$ and $\begin{bmatrix}-3.0 & -4.0 & 3.0\end{bmatrix}$, where Ax + By + C = 0

224. Ray R has starting point e=$\begin{bmatrix}4.48 & -3.8 & -2.82\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.51 & -0.51 & 0.69\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}1.74 & -1.29 & -5.16\end{bmatrix}\begin{bmatrix}1.74 & -5.74 & -1.81\end{bmatrix}\begin{bmatrix}3.23 & -4.26 & -3.67\end{bmatrix}\begin{bmatrix}5.09 & -7.97 & -1.8$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

225. What are the A, B, and C components of the line passing through $\begin{bmatrix}-1.0 & -5.0 & -5.0\end{bmatrix}$ and $\begin{bmatrix}-5.0 & -1.0 & 2.0\end{bmatrix}$, where Ax + By + C = 0

226. What are the barycentric coordinates of point P=$\begin{bmatrix}-2.73 & 2.55 & 1.0\end{bmatrix}$ with respect to triangle T with vertices 1.00 0.00 -1.00 2.00 4.00 3.00 1.00 -4.00 -3.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.0 & 1.0 & 0.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}4.0 & 1.0 & 1.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.2 & 0.2 & 1.0\end{bmatrix}$, what is P's color?

227. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 1) in a 626 x 697 image with the following parameters? l=0, r=2, b=-1, t=2 view type = orthographic camera origin = $\begin{bmatrix}-2.0 & -1.0 & -3.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.0 & -0.98 & 0.2\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.0 & 0.0 & -1.0\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.67 & 0.67 & -0.33\end{bmatrix}$

228. Triangle T has vertices p0=$\begin{bmatrix}-2.0 & -1.0 & 2.0\end{bmatrix}$, p1=$\begin{bmatrix}-2.0 & 0.0 & 5.0\end{bmatrix}$, p2=$\begin{bmatrix}-2.0 & 3.0 & -1.0\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-3.99 & 3.76 & 0.45\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.59 & -0.78 & 0.2\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

229. What are the A, B, and C components of the line passing through $\begin{bmatrix}-3.0 & 2.0 & 4.0\end{bmatrix}$ and $\begin{bmatrix}-5.0 & 0.0 & 2.0\end{bmatrix}$, where Ax + By + C = 0

230. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 4) in a 452 x 519 image with the following parameters? l=-3, r=3, b=-2, t=3 view type = perspective camera origin = $\begin{bmatrix}-4.0 & -5.0 & -2.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.32 & 0.49 & -0.81\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.19 & -0.96 & 0.19\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.53 & -0.8 & 0.27\end{bmatrix}$

231. What are the A, B, and C components of the line passing through $\begin{bmatrix}-5.0 & -1.0 & -4.0\end{bmatrix}$ and $\begin{bmatrix}4.0 & 4.0 & 2.0\end{bmatrix}$, where Ax + By + C = 0

232. Triangle T has vertices p0=$\begin{bmatrix}5.87 & -6.87 & -2.87\end{bmatrix}$, p1=$\begin{bmatrix}5.6 & -0.19 & -5.81\end{bmatrix}$, p2=$\begin{bmatrix}1.33 & -1.79 & 1.41\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}2.11 & -3.25 & 0.54\end{bmatrix}$ and direction d=$\begin{bmatrix}0.6 & -0.0 & -0.8\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

233. Triangle T has vertices p0=$\begin{bmatrix}-5.12 & -3.12 & 1.88\end{bmatrix}$, p1=$\begin{bmatrix}1.24 & -4.54 & 0.46\end{bmatrix}$, p2=$\begin{bmatrix}-5.83 & -4.54 & 0.46\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-3.82 & -6.31 & -2.85\end{bmatrix}$ and direction d=$\begin{bmatrix}0.46 & 0.46 & 0.76\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

234. What are the A, B, and C components of the line passing through $\begin{bmatrix}-1.0 & -3.0 & -4.0\end{bmatrix}$ and $\begin{bmatrix}-1.0 & 0.0 & 4.0\end{bmatrix}$, where Ax + By + C = 0

235. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 1) in a 537 x 544 image with the following parameters? l=-2, r=-1, b=-5, t=-3 view type = orthographic camera origin = $\begin{bmatrix}4.0 & 4.0 & 2.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.64 & 0.64 & -0.43\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.33 & 0.67 & -0.67\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.6 & 0.0 & 0.8\end{bmatrix}$

236. Ray R has starting point e=$\begin{bmatrix}-8.16 & -0.69 & -0.97\end{bmatrix}$ and direction d=$\begin{bmatrix}0.15 & 0.77 & 0.62\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}0.41 & 5.78 & 3.21\end{bmatrix}\begin{bmatrix}3.06 & 3.93 & 1.75\end{bmatrix}\begin{bmatrix}2.53 & 3.4 & 2.94\end{bmatrix}\begin{bmatrix}3.06 & 0.62 & 5.06\end{bmatrix}\begin{bmatrix}2.0 & 1.68 & 5$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection 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 barycentric coordinates of point P=$\begin{bmatrix}-9.23 & 1.24 & 1.0\end{bmatrix}$ with respect to triangle T with vertices -4.00 -2.00 3.00 -2.00 0.00 0.00 0.00 4.00 -2.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}0.8 & 0.5 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 1.5 & 1.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.5 & 1.0 & 2.0\end{bmatrix}$, what is P's color?

238. Ray R has starting point e=$\begin{bmatrix}-7.61 & -6.61 & -3.7\end{bmatrix}$ and direction d=$\begin{bmatrix}0.14 & 0.7 & 0.7\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}1.6 & 5.4 & 3.8\end{bmatrix}\begin{bmatrix}-1.4 & -2.4 & -0.2\end{bmatrix}\begin{bmatrix}-2.0 & 0.8 & -1.0\end{bmatrix}\begin{bmatrix}-2.0 & -0.6 & -1.0\end{bmatrix}\begin{bmatrix}-2.0 & -2.2 & -1.0\end{bmatrix}$
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?

239. What are the barycentric coordinates of point P=$\begin{bmatrix}3.87 & -2.27 & -2.79\end{bmatrix}$ with respect to triangle T with vertices -5.00 -1.00 -2.00 4.00 4.00 -1.00 4.00 -3.00 -3.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}0.5 & 1.5 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 1.0 & 0.5\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.2 & 1.2 & 1.0\end{bmatrix}$, what is P's color?

240. Ray R has starting point e=$\begin{bmatrix}-9.02 & -0.37 & 0.94\end{bmatrix}$ and direction d=$\begin{bmatrix}0.97 & -0.0 & 0.24\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}3.67 & -1.47 & -3.47\end{bmatrix}\begin{bmatrix}-1.14 & -0.4 & -7.47\end{bmatrix}\begin{bmatrix}1.53 & -2.53 & -2.93\end{bmatrix}\begin{bmatrix}3.67 & 0.67 & -6.67\end{bmatrix}\begin{bmatrix}1.8$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

241. What are the A, B, and C components of the line passing through $\begin{bmatrix}-4.0 & -1.0 & -5.0\end{bmatrix}$ and $\begin{bmatrix}-2.0 & -3.0 & 2.0\end{bmatrix}$, where Ax + By + C = 0

242. Ray R has starting point e=$\begin{bmatrix}-1.68 & -0.46 & 0.85\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.53 & -0.8 & 0.27\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}2.49 & -3.14 & 2.51\end{bmatrix}\begin{bmatrix}4.43 & -4.43 & 2.51\end{bmatrix}\begin{bmatrix}3.78 & 0.6 & 5.27\end{bmatrix}\begin{bmatrix}-0.6 & 1.08 & 3.81\end{bmatrix}\begin{bmatrix}5.89 & -$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection 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. Ray R has starting point e=$\begin{bmatrix}-5.33 & -1.72 & 1.36\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.46 & 0.76 & -0.46\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}0.0 & -3.0 & -5.8\end{bmatrix}\begin{bmatrix}5.6 & 1.2 & -5.8\end{bmatrix}\begin{bmatrix}2.4 & -1.2 & -2.8\end{bmatrix}\begin{bmatrix}4.0 & 0.0 & -3.0\end{bmatrix}\begin{bmatrix}5.6 & 1.2 & -1.6\end{bmatrix}$
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?

244. Ray R has starting point e=$\begin{bmatrix}-13.6 & -1.77 & -0.28\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.0 & 0.93 & 0.37\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-3.4 & 1.2 & -0.4\end{bmatrix}\begin{bmatrix}-5.8 & -0.6 & -2.6\end{bmatrix}\begin{bmatrix}-2.6 & 1.8 & -6.0\end{bmatrix}\begin{bmatrix}-5.0 & 0.0 & -3.2\end{bmatrix}\begin{bmatrix}-5.8 & -$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection 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 A, B, and C components of the line passing through $\begin{bmatrix}-4.0 & 4.0 & -5.0\end{bmatrix}$ and $\begin{bmatrix}2.0 & 4.0 & 2.0\end{bmatrix}$, where Ax + By + C = 0

246. What are the barycentric coordinates of point P=$\begin{bmatrix}0.34 & -1.39 & 1.0\end{bmatrix}$ with respect to triangle T with vertices 4.00 -2.00 -1.00 2.00 -3.00 -5.00 3.00 -1.00 0.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.0 & 1.0 & 0.5\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}0.7 & 0.7 & 1.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.0 & 2.0 & 1.0\end{bmatrix}$, what is P's color?

247. Ray R has starting point e=$\begin{bmatrix}-16.18 & -0.06 & 0.57\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.3 & -0.3 & 0.9\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-2.0 & 7.0 & 4.0\end{bmatrix}\begin{bmatrix}-5.0 & 1.0 & 4.0\end{bmatrix}\begin{bmatrix}-1.0 & 7.0 & 4.0\end{bmatrix}\begin{bmatrix}-8.0 & 1.0 & 4.0\end{bmatrix}\begin{bmatrix}-8.0 & -2.0 & 4.0\end{bmatrix}$.
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?

248. What are the barycentric coordinates of point P=$\begin{bmatrix}-8.25 & 1.98 & 1.0\end{bmatrix}$ with respect to triangle T with vertices 0.00 -3.00 -3.00 4.00 1.00 -1.00 -4.00 2.00 3.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.0 & 2.0 & 4.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}0.3 & 1.0 & 0.7\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}0.0 & 1.3 & 1.0\end{bmatrix}$, what is P's color?

249. Triangle T has vertices p0=$\begin{bmatrix}1.21 & 2.87 & -1.43\end{bmatrix}$, p1=$\begin{bmatrix}3.3 & -0.96 & -5.79\end{bmatrix}$, p2=$\begin{bmatrix}-2.27 & 3.22 & -0.21\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}1.17 & 0.67 & -3.54\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.62 & 0.78 & -0.0\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

250. Ray R has starting point e=$\begin{bmatrix}-9.23 & -6.41 & 4.02\end{bmatrix}$ and direction d=$\begin{bmatrix}0.71 & -0.0 & -0.71\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-0.44 & -6.98 & -7.13\end{bmatrix}\begin{bmatrix}4.38 & -5.38 & -3.92\end{bmatrix}\begin{bmatrix}8.51 & -5.61 & -2.77\end{bmatrix}\begin{bmatrix}4.38 & -6.98 & -5$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

251. Ray R has starting point e=$\begin{bmatrix}-1.94 & 3.53 & 0.97\end{bmatrix}$ and direction d=$\begin{bmatrix}0.2 & 0.59 & 0.78\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-0.69 & 5.38 & 0.94\end{bmatrix}\begin{bmatrix}-2.75 & 5.61 & 6.44\end{bmatrix}\begin{bmatrix}-1.15 & 5.15 & 3.0\end{bmatrix}\begin{bmatrix}-0.46 & 4.23 & 3.69\end{bmatrix}\begin{bmatrix}0.92 & 3.54 & 1$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

252. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 0) in a 345 x 633 image with the following parameters? l=-5, r=-2, b=-2, t=1 view type = perspective camera origin = $\begin{bmatrix}1.0 & -3.0 & 3.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.0 & -0.95 & -0.32\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.0 & 0.6 & -0.8\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.41 & -0.41 & 0.82\end{bmatrix}$

253. Ray R has starting point e=$\begin{bmatrix}1.81 & 1.19 & -0.91\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.0 & -0.97 & -0.24\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}0.23 & -0.61 & 1.73\end{bmatrix}\begin{bmatrix}1.41 & 0.18 & -4.94\end{bmatrix}\begin{bmatrix}4.55 & -2.96 & -1.8\end{bmatrix}\begin{bmatrix}-0.16 & 0.37 & -1.02\end{bmatrix}\begin{bmatrix}2.$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection 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. What are the barycentric coordinates of point P=$\begin{bmatrix}-7.63 & 3.86 & 1.0\end{bmatrix}$ with respect to triangle T with vertices 3.00 2.00 -2.00 2.00 4.00 3.00 -3.00 3.00 0.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}0.3 & 1.0 & 0.7\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 0.8 & 1.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.0 & 1.2 & 1.0\end{bmatrix}$, what is P's color?

255. What are the A, B, and C components of the line passing through $\begin{bmatrix}-2.0 & 2.0 & -4.0\end{bmatrix}$ and $\begin{bmatrix}4.0 & 4.0 & 1.0\end{bmatrix}$, where Ax + By + C = 0

256. Triangle T has vertices p0=$\begin{bmatrix}4.11 & -1.33 & -0.66\end{bmatrix}$, p1=$\begin{bmatrix}3.55 & 0.61 & 0.17\end{bmatrix}$, p2=$\begin{bmatrix}4.11 & -0.5 & -0.66\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-0.78 & -5.28 & 0.44\end{bmatrix}$ and direction d=$\begin{bmatrix}0.7 & 0.7 & -0.14\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

257. Ray R has starting point e=$\begin{bmatrix}-16.95 & 6.08 & 1.0\end{bmatrix}$ and direction d=$\begin{bmatrix}0.78 & -0.62 & -0.0\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}1.41 & 5.34 & -3.71\end{bmatrix}\begin{bmatrix}1.04 & 1.63 & -0.74\end{bmatrix}\begin{bmatrix}-4.9 & 0.89 & 2.79\end{bmatrix}\begin{bmatrix}-0.44 & 0.14 & 1.11\end{bmatrix}\begin{bmatrix}-0.63 & 0.$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

258. What are the barycentric coordinates of point P=$\begin{bmatrix}-1.89 & 2.44 & 0.57\end{bmatrix}$ with respect to triangle T with vertices -2.00 3.00 1.00 -3.00 -3.00 -4.00 1.00 -4.00 -4.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}0.2 & 0.8 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 2.5 & 2.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.0 & 2.0 & 0.0\end{bmatrix}$, what is P's color?

259. What are the A, B, and C components of the line passing through $\begin{bmatrix}2.0 & 3.0 & -5.0\end{bmatrix}$ and $\begin{bmatrix}1.0 & -5.0 & -1.0\end{bmatrix}$, where Ax + By + C = 0

260. What are the A, B, and C components of the line passing through $\begin{bmatrix}3.0 & -2.0 & 4.0\end{bmatrix}$ and $\begin{bmatrix}1.0 & 4.0 & 4.0\end{bmatrix}$, where Ax + By + C = 0

261. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 2) in a 467 x 346 image with the following parameters? l=-5, r=-4, b=2, t=4 view type = perspective camera origin = $\begin{bmatrix}3.0 & 4.0 & -1.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.17 & -0.7 & -0.7\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.62 & -0.62 & -0.49\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.87 & 0.35 & 0.35\end{bmatrix}$

262. What are the barycentric coordinates of point P=$\begin{bmatrix}-3.1 & 0.2 & -2.44\end{bmatrix}$ with respect to triangle T with vertices -4.00 0.00 -3.00 4.00 2.00 2.00 0.00 -3.00 -1.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.0 & 1.0 & 5.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 0.0 & 0.5\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}2.0 & 5.0 & 1.0\end{bmatrix}$, what is P's color?

263. Triangle T has vertices p0=$\begin{bmatrix}-1.41 & 7.16 & -3.11\end{bmatrix}$, p1=$\begin{bmatrix}3.79 & 4.0 & 1.71\end{bmatrix}$, p2=$\begin{bmatrix}1.74 & 8.64 & 2.09\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-0.68 & 2.4 & 3.39\end{bmatrix}$ and direction d=$\begin{bmatrix}0.74 & 0.56 & -0.37\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) 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 (2, 3) in a 539 x 454 image with the following parameters? l=-5, r=1, b=-3, t=1 view type = orthographic camera origin = $\begin{bmatrix}-3.0 & -1.0 & 2.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.69 & -0.23 & -0.69\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.78 & -0.2 & 0.59\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.0 & -1.0 & 0.0\end{bmatrix}$

265. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 2) in a 509 x 366 image with the following parameters? l=-3, r=-2, b=-3, t=1 view type = orthographic camera origin = $\begin{bmatrix}1.0 & 0.0 & 3.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.0 & -0.71 & 0.71\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.47 & -0.62 & 0.62\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.15 & 0.62 & -0.77\end{bmatrix}$

266. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 0) in a 337 x 398 image with the following parameters? l=-1, r=0, b=2, t=3 view type = orthographic camera origin = $\begin{bmatrix}3.0 & -5.0 & 4.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.94 & -0.24 & 0.24\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.74 & 0.37 & -0.56\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.3 & -0.9 & -0.3\end{bmatrix}$

267. Ray R has starting point e=$\begin{bmatrix}-0.48 & 2.63 & -0.16\end{bmatrix}$ and direction d=$\begin{bmatrix}0.74 & -0.37 & 0.56\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}1.7 & -3.4 & 1.23\end{bmatrix}\begin{bmatrix}1.23 & 0.15 & 0.92\end{bmatrix}\begin{bmatrix}0.62 & 3.85 & 0.77\end{bmatrix}\begin{bmatrix}2.01 & 6.78 & -1.7\end{bmatrix}\begin{bmatrix}-0.77 & -0$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

268. Ray R has starting point e=$\begin{bmatrix}0.58 & -1.2 & -5.62\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.22 & -0.87 & 0.44\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-1.26 & -5.04 & -0.77\end{bmatrix}\begin{bmatrix}0.41 & -4.49 & -2.63\end{bmatrix}\begin{bmatrix}0.23 & -2.44 & -5.23\end{bmatrix}\begin{bmatrix}-3.49 & -3.93 & -$
b) What is the normal to P?
c) What is the t intersection point of R and P?

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

269. What are the barycentric coordinates of point P=$\begin{bmatrix}1.31 & 2.77 & -1.5\end{bmatrix}$ with respect to triangle T with vertices 1.00 4.00 -4.00 -1.00 4.00 -3.00 4.00 1.00 1.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}4.0 & 1.0 & 4.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 0.0 & 0.5\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.0 & 0.0 & 1.0\end{bmatrix}$, what is P's color?

270. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 0) in a 271 x 746 image with the following parameters? l=-3, r=1, b=-3, t=1 view type = perspective camera origin = $\begin{bmatrix}-1.0 & -1.0 & -5.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.42 & -0.57 & -0.71\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.42 & -0.71 & 0.57\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.62 & -0.77 & 0.15\end{bmatrix}$

271. Ray R has starting point e=$\begin{bmatrix}3.02 & 3.21 & 0.29\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.7 & -0.7 & 0.17\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}1.51 & -1.94 & -4.97\end{bmatrix}\begin{bmatrix}2.73 & 2.91 & -2.06\end{bmatrix}\begin{bmatrix}2.0 & 0.0 & -3.03\end{bmatrix}\begin{bmatrix}2.49 & 1.94 & -3.03\end{bmatrix}\begin{bmatrix}1.27 & -2.91$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection 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 (4, 0) in a 732 x 277 image with the following parameters? l=-4, r=-2, b=-2, t=1 view type = perspective camera origin = $\begin{bmatrix}-4.0 & 4.0 & 2.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.62 & -0.77 & 0.15\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.19 & -0.19 & -0.96\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.0 & -0.83 & 0.55\end{bmatrix}$

273. Ray R has starting point e=$\begin{bmatrix}-14.15 & 2.88 & 2.02\end{bmatrix}$ and direction d=$\begin{bmatrix}0.56 & 0.74 & -0.37\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}0.94 & 1.59 & -4.14\end{bmatrix}\begin{bmatrix}-2.8 & 4.27 & -2.0\end{bmatrix}\begin{bmatrix}-1.47 & 6.14 & 1.47\end{bmatrix}\begin{bmatrix}-4.14 & 2.93 & -4.67\end{bmatrix}\begin{bmatrix}1.21 & 2$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

274. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 2) in a 470 x 282 image with the following parameters? l=-4, r=2, b=3, t=4 view type = orthographic camera origin = $\begin{bmatrix}3.0 & 4.0 & 1.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.71 & -0.71 & 0.0\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.62 & 0.62 & 0.47\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.91 & -0.37 & 0.18\end{bmatrix}$

275. What are the A, B, and C components of the line passing through $\begin{bmatrix}1.0 & -1.0 & 2.0\end{bmatrix}$ and $\begin{bmatrix}1.0 & -1.0 & -4.0\end{bmatrix}$, where Ax + By + C = 0

276. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 4) in a 387 x 649 image with the following parameters? l=4, r=5, b=2, t=3 view type = orthographic camera origin = $\begin{bmatrix}-5.0 & -3.0 & 2.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.2 & 0.78 & 0.59\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.0 & -0.95 & -0.32\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.73 & 0.49 & 0.49\end{bmatrix}$

277. Ray R has starting point e=$\begin{bmatrix}0.89 & -0.74 & 4.69\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.18 & 0.37 & 0.91\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}4.0 & 0.0 & 6.0\end{bmatrix}\begin{bmatrix}-2.0 & 0.0 & -1.0\end{bmatrix}\begin{bmatrix}0.0 & 0.0 & 7.0\end{bmatrix}\begin{bmatrix}3.0 & 0.0 & 6.0\end{bmatrix}\begin{bmatrix}4.0 & 0.0 & 3.0\end{bmatrix}$.

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?

278. What are the A, B, and C components of the line passing through $\begin{bmatrix}3.0 & 2.0 & 4.0\end{bmatrix}$ and $\begin{bmatrix}3.0 & -5.0 & -4.0\end{bmatrix}$, where Ax + By + C = 0

279. Triangle T has vertices p0=$\begin{bmatrix}-3.59 & -3.95 & 0.59\end{bmatrix}$, p1=$\begin{bmatrix}-1.46 & 0.29 & -1.54\end{bmatrix}$, p2=$\begin{bmatrix}-7.83 & 2.41 & 4.83\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-3.9 & 1.07 & 0.19\end{bmatrix}$ and direction d=$\begin{bmatrix}0.66 & -0.53 & 0.53\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

280. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 4) in a 649 x 292 image with the following parameters? l=1, r=3, b=-1, t=3 view type = orthographic camera origin = $\begin{bmatrix}3.0 & -1.0 & -3.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.64 & -0.64 & 0.43\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.37 & 0.56 & -0.74\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.17 & -0.51 & -0.85\end{bmatrix}$

281. What are the barycentric coordinates of point P=$\begin{bmatrix}-13.56 & -0.86 & 1.0\end{bmatrix}$ with respect to triangle T with vertices -5.00 -2.00 0.00 3.00 0.00 0.00 -2.00 -5.00 -2.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.0 & 1.3 & 0.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.5 & 1.0 & 2.5\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.7 & 1.0 & 0.7\end{bmatrix}$, what is P's color?

282. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 3) in a 745 x 509 image with the following parameters? l=-4, r=1, b=-4, t=2 view type = perspective camera origin = $\begin{bmatrix}4.0 & 2.0 & 1.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.24 & -0.24 & -0.94\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.18 & 0.37 & -0.91\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.41 & 0.41 & 0.82\end{bmatrix}$

283. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 4) in a 610 x 398 image with the following parameters? l=2, r=3, b=-3, t=-2 view type = orthographic camera origin = $\begin{bmatrix}3.0 & 2.0 & 0.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.82 & -0.41 & 0.41\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.37 & -0.93 & 0.0\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.37 & -0.74 & -0.56\end{bmatrix}$

284. What are the barycentric coordinates of point P=$\begin{bmatrix}-5.64 & -4.0 & 1.0\end{bmatrix}$ with respect to triangle T with vertices -3.00 -2.00 3.00 -1.00 -1.00 0.00 -2.00 -5.00 4.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.0 & 0.5 & 0.2\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 0.5 & 1.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}0.2 & 1.0 & 0.0\end{bmatrix}$, what is P's color?

285. Ray R has starting point e=$\begin{bmatrix}-0.43 & 5.95 & -2.98\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.18 & -0.37 & 0.91\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}1.41 & 2.22 & 1.59\end{bmatrix}\begin{bmatrix}0.59 & -2.67 & 4.86\end{bmatrix}\begin{bmatrix}-0.22 & -0.63 & 1.18\end{bmatrix}\begin{bmatrix}0.59 & -0.22 & 2.41\end{bmatrix}\begin{bmatrix}3.86$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection 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. Triangle T has vertices p0=$\begin{bmatrix}-5.53 & 0.69 & 5.18\end{bmatrix}$, p1=$\begin{bmatrix}-7.93 & 1.13 & -1.36\end{bmatrix}$, p2=$\begin{bmatrix}-7.06 & -0.4 & 6.49\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-7.37 & 0.6 & 3.45\end{bmatrix}$ and direction d=$\begin{bmatrix}0.89 & -0.0 & -0.45\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

287. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 3) in a 297 x 735 image with the following parameters? l=-4, r=0, b=-5, t=4 view type = orthographic camera origin = $\begin{bmatrix}1.0 & -2.0 & 2.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.56 & 0.74 & 0.37\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.45 & 0.0 & 0.89\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.18 & -0.37 & -0.91\end{bmatrix}$

288. What are the barycentric coordinates of point P=$\begin{bmatrix}-3.62 & -2.51 & -1.79\end{bmatrix}$ with respect to triangle T with vertices -4.00 -2.00 -3.00 -3.00 0.00 -4.00 -3.00 -4.00 1.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}2.5 & 1.0 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 0.0 & 0.8\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}4.0 & 1.0 & 0.0\end{bmatrix}$, what is P's color?

289. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 2) in a 652 x 437 image with the following parameters? l=-2, r=1, b=1, t=2 view type = orthographic camera origin = $\begin{bmatrix}4.0 & 4.0 & 0.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.67 & -0.33 & 0.67\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.0 & -0.95 & 0.32\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.0 & -0.8 & -0.6\end{bmatrix}$

290. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 1) in a 734 x 385 image with the following parameters? l=-3, r=1, b=-5, t=-2 view type = perspective camera origin = $\begin{bmatrix}-3.0 & -2.0 & 4.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.2 & 0.59 & -0.78\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.71 & 0.71 & 0.0\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.7 & -0.7 & -0.17\end{bmatrix}$

291. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 3) in a 371 x 360 image with the following parameters? l=0, r=4, b=3, t=4 view type = orthographic camera origin = $\begin{bmatrix}1.0 & -1.0 & 0.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.22 & 0.44 & 0.87\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.43 & -0.64 & -0.64\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.77 & 0.15 & -0.62\end{bmatrix}$

292. What are the A, B, and C components of the line passing through $\begin{bmatrix}2.0 & 2.0 & -1.0\end{bmatrix}$ and $\begin{bmatrix}-1.0 & 2.0 & -3.0\end{bmatrix}$, where Ax + By + C = 0

293. Ray R has starting point e=$\begin{bmatrix}-6.21 & 0.92 & -2.98\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.24 & -0.0 & 0.97\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}2.26 & 0.49 & -3.49\end{bmatrix}\begin{bmatrix}2.81 & -0.07 & -3.11\end{bmatrix}\begin{bmatrix}3.74 & -0.26 & -3.49\end{bmatrix}\begin{bmatrix}-1.27 & 1.41 & -2.37\end{bmatrix}$
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?

294. What are the A, B, and C components of the line passing through $\begin{bmatrix}-4.0 & 0.0 & 0.0\end{bmatrix}$ and $\begin{bmatrix}-2.0 & 2.0 & 4.0\end{bmatrix}$, where Ax + By + C = 0

295. What are the barycentric coordinates of point P=$\begin{bmatrix}-9.71 & -0.29 & 1.0\end{bmatrix}$ with respect to triangle T with vertices 0.00 -4.00 -4.00 -2.00 -1.00 -1.00 2.00 1.00 1.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}5.0 & 1.0 & 0.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 1.3 & 0.7\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.0 & 0.5 & 1.2\end{bmatrix}$, what is P's color?

296. Ray R has starting point e=$\begin{bmatrix}-17.46 & 2.18 & 1.06\end{bmatrix}$ and direction d=$\begin{bmatrix}0.98 & -0.0 & -0.2\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-6.41 & 2.59 & -7.95\end{bmatrix}\begin{bmatrix}-4.29 & 4.71 & 1.24\end{bmatrix}\begin{bmatrix}-5.0 & 4.0 & 3.36\end{bmatrix}\begin{bmatrix}-6.41 & 2.59 & -1.59\end{bmatrix}\begin{bmatrix}-7.83$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

297. Ray R has starting point e=$\begin{bmatrix}-3.58 & 2.52 & 1.92\end{bmatrix}$ and direction d=$\begin{bmatrix}0.56 & 0.74 & -0.37\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}1.13 & 5.87 & 3.87\end{bmatrix}\begin{bmatrix}-1.01 & 7.21 & 5.47\end{bmatrix}\begin{bmatrix}0.33 & 4.27 & 3.07\end{bmatrix}\begin{bmatrix}5.41 & 8.01 & 3.87\end{bmatrix}\begin{bmatrix}0.59 & 4.8 & 3.3$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

298. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 0) in a 371 x 563 image with the following parameters? l=-1, r=1, b=-1, t=3 view type = perspective camera origin = $\begin{bmatrix}2.0 & -2.0 & 1.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.53 & 0.8 & 0.27\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.56 & 0.37 & 0.74\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.49 & -0.49 & -0.73\end{bmatrix}$

299. Triangle T has vertices p0=$\begin{bmatrix}-1.87 & -0.75 & 0.13\end{bmatrix}$, p1=$\begin{bmatrix}4.46 & -1.18 & 3.18\end{bmatrix}$, p2=$\begin{bmatrix}3.15 & -0.31 & 2.75\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}1.47 & -2.94 & 3.71\end{bmatrix}$ and direction d=$\begin{bmatrix}0.46 & 0.76 & -0.46\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

300. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 0) in a 324 x 736 image with the following parameters? l=0, r=2, b=-3, t=1 view type = perspective camera origin = $\begin{bmatrix}0.0 & -2.0 & -4.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.9 & -0.3 & 0.3\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.8 & -0.27 & -0.53\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.2 & -0.98 & 0.0\end{bmatrix}$

301. What are the barycentric coordinates of point P=$\begin{bmatrix}0.56 & 1.43 & -3.11\end{bmatrix}$ with respect to triangle T with vertices 1.00 1.00 -5.00 1.00 -3.00 0.00 0.00 3.00 -2.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}2.5 & 2.0 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}0.8 & 1.2 & 1.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}0.2 & 1.0 & 0.5\end{bmatrix}$, what is P's color?

302. What are the A, B, and C components of the line passing through $\begin{bmatrix}3.0 & 2.0 & -4.0\end{bmatrix}$ and $\begin{bmatrix}4.0 & 0.0 & 2.0\end{bmatrix}$, where Ax + By + C = 0

303. Ray R has starting point e=$\begin{bmatrix}-9.66 & -7.9 & 1.0\end{bmatrix}$ and direction d=$\begin{bmatrix}1.0 & -0.0 & -0.0\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-3.12 & -3.38 & 2.28\end{bmatrix}\begin{bmatrix}2.5 & -8.37 & 1.5\end{bmatrix}\begin{bmatrix}1.87 & -4.94 & 4.47\end{bmatrix}\begin{bmatrix}1.25 & -4.0 & 4.94\end{bmatrix}\begin{bmatrix}2.5 & -2.44 & 7$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection 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 A, B, and C components of the line passing through $\begin{bmatrix}0.0 & -5.0 & -1.0\end{bmatrix}$ and $\begin{bmatrix}-5.0 & -3.0 & -4.0\end{bmatrix}$, where Ax + By + C = 0

305. Triangle T has vertices p0=$\begin{bmatrix}0.97 & -0.94 & 5.94\end{bmatrix}$, p1=$\begin{bmatrix}4.61 & -1.43 & 3.03\end{bmatrix}$, p2=$\begin{bmatrix}-2.43 & 2.46 & 4.24\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-6.97 & 2.25 & 1.0\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.89 & 0.45 & -0.0\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

306. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 2) in a 289 x 586 image with the following parameters? l=2, r=3, b=-5, t=-4 view type = orthographic camera origin = $\begin{bmatrix}-3.0 & 3.0 & -2.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.41 & 0.41 & 0.82\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.32 & 0.95 & 0.0\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.56 & -0.74 & -0.37\end{bmatrix}$

307. What are the barycentric coordinates of point P=$\begin{bmatrix}-0.06 & 0.13 & 1.29\end{bmatrix}$ with respect to triangle T with vertices 3.00 -4.00 2.00 1.00 2.00 3.00 -1.00 -1.00 0.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}0.7 & 1.3 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 0.2 & 0.8\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}0.7 & 0.0 & 1.0\end{bmatrix}$, what is P's color?

308. Ray R has starting point e=$\begin{bmatrix}-9.18 & -6.57 & 1.48\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.24 & 0.94 & -0.24\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-2.76 & -5.0 & -1.76\end{bmatrix}\begin{bmatrix}-4.9 & -4.09 & -2.37\end{bmatrix}\begin{bmatrix}-0.17 & -3.63 & 3.12\end{bmatrix}\begin{bmatrix}-3.52 & -4.09 & -$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection 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 A, B, and C components of the line passing through $\begin{bmatrix}-4.0 & -5.0 & -1.0\end{bmatrix}$ and $\begin{bmatrix}-2.0 & -4.0 & 2.0\end{bmatrix}$, where Ax + By + C = 0

310. Ray R has starting point e=$\begin{bmatrix}-3.15 & -6.26 & 1.38\end{bmatrix}$ and direction d=$\begin{bmatrix}0.53 & 0.27 & 0.8\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-1.0 & -3.0 & 4.0\end{bmatrix}\begin{bmatrix}-2.6 & -8.2 & 2.8\end{bmatrix}\begin{bmatrix}-0.2 & -0.2 & 4.6\end{bmatrix}\begin{bmatrix}0.6 & -4.0 & 5.2\end{bmatrix}\begin{bmatrix}-2.6 & -6.0 & 2.8$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection 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 barycentric coordinates of point P=$\begin{bmatrix}-4.26 & -1.46 & 1.0\end{bmatrix}$ with respect to triangle T with vertices 3.00 -1.00 -2.00 3.00 -4.00 2.00 -2.00 -1.00 -4.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.0 & 1.0 & 1.7\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}0.2 & 1.0 & 0.2\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}2.0 & 1.0 & 1.0\end{bmatrix}$, what is P's color?

312. What are the barycentric coordinates of point P=$\begin{bmatrix}-1.49 & -1.67 & -2.62\end{bmatrix}$ with respect to triangle T with vertices -4.00 -3.00 -3.00 4.00 1.00 -2.00 0.00 4.00 2.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.0 & 1.0 & 0.3\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}0.0 & 0.0 & 1.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.0 & 1.0 & 0.2\end{bmatrix}$, what is P's color?

313. What are the barycentric coordinates of point P=$\begin{bmatrix}-11.06 & 1.9 & 1.0\end{bmatrix}$ with respect to triangle T with vertices 2.00 -1.00 2.00 -5.00 -4.00 1.00 1.00 3.00 4.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}0.7 & 1.0 & 0.3\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.7 & 1.3 & 1.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.0 & 0.2 & 1.0\end{bmatrix}$, what is P's color?

314. What are the A, B, and C components of the line passing through $\begin{bmatrix}-1.0 & 4.0 & 3.0\end{bmatrix}$ and $\begin{bmatrix}-4.0 & -2.0 & -3.0\end{bmatrix}$, where Ax + By + C = 0

315. What are the barycentric coordinates of point P=$\begin{bmatrix}-2.16 & 0.36 & -2.63\end{bmatrix}$ with respect to triangle T with vertices -5.00 1.00 -1.00 0.00 4.00 -3.00 -2.00 -1.00 -3.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.0 & 1.2 & 1.2\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}0.0 & 0.0 & 1.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.0 & 0.0 & 5.0\end{bmatrix}$, what is P's color?

316. What are the barycentric coordinates of point P=$\begin{bmatrix}-4.77 & -2.87 & -2.1\end{bmatrix}$ with respect to triangle T with vertices -4.00 -3.00 -3.00 -5.00 -5.00 -4.00 -5.00 0.00 1.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}4.0 & 1.0 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 0.5 & 0.2\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}0.8 & 0.0 & 1.0\end{bmatrix}$, what is P's color?

317. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 1) in a 603 x 545 image with the following parameters? l=-1, r=0, b=3, t=4 view type = perspective camera origin = $\begin{bmatrix}2.0 & 1.0 & 1.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.71 & 0.71 & 0.0\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.87 & 0.22 & -0.44\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.53 & 0.8 & 0.27\end{bmatrix}$

318. Ray R has starting point e=$\begin{bmatrix}3.88 & -1.26 & -5.28\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.41 & 0.82 & -0.41\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}5.75 & 3.13 & 2.13\end{bmatrix}\begin{bmatrix}3.46 & -2.15 & -6.82\end{bmatrix}\begin{bmatrix}5.52 & 1.52 & -2.0\end{bmatrix}\begin{bmatrix}0.71 & -2.61 & 0.06\end{bmatrix}\begin{bmatrix}6.21$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

319. What are the barycentric coordinates of point P=$\begin{bmatrix}-1.46 & 1.21 & 2.49\end{bmatrix}$ with respect to triangle T with vertices -3.00 4.00 -4.00 -3.00 -5.00 2.00 -1.00 1.00 4.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.0 & 2.0 & 0.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 0.7 & 0.3\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}3.0 & 0.0 & 1.0\end{bmatrix}$, what is P's color?

320. What are the A, B, and C components of the line passing through $\begin{bmatrix}-5.0 & -4.0 & -1.0\end{bmatrix}$ and $\begin{bmatrix}-1.0 & 0.0 & 1.0\end{bmatrix}$, where Ax + By + C = 0

321. Ray R has starting point e=$\begin{bmatrix}-6.73 & 3.39 & -1.29\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.45 & -0.0 & -0.89\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-7.31 & 3.58 & -2.27\end{bmatrix}\begin{bmatrix}-7.31 & 3.58 & -2.27\end{bmatrix}\begin{bmatrix}-6.15 & 1.85 & -1.69\end{bmatrix}\begin{bmatrix}-2.69 & 1.27 & -4.5$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection 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. Ray R has starting point e=$\begin{bmatrix}1.92 & 2.07 & 4.31\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.42 & 0.71 & -0.57\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-1.04 & 0.96 & -2.04\end{bmatrix}\begin{bmatrix}1.82 & 7.08 & 2.45\end{bmatrix}\begin{bmatrix}-2.27 & 7.08 & 0.41\end{bmatrix}\begin{bmatrix}-3.9 & 7.08 & -0.41\end{bmatrix}\begin{bmatrix}4.67 & -$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

323. What are the A, B, and C components of the line passing through $\begin{bmatrix}3.0 & -5.0 & 4.0\end{bmatrix}$ and $\begin{bmatrix}1.0 & 2.0 & -4.0\end{bmatrix}$, where Ax + By + C = 0

324. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 2) in a 323 x 250 image with the following parameters? l=-2, r=0, b=-1, t=2 view type = orthographic camera origin = $\begin{bmatrix}1.0 & 0.0 & -2.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.86 & 0.0 & -0.51\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.33 & -0.67 & -0.67\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.87 & 0.44 & 0.22\end{bmatrix}$

325. Ray R has starting point e=$\begin{bmatrix}4.73 & -7.63 & -4.8\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.58 & 0.58 & 0.58\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}1.65 & -6.6 & -1.09\end{bmatrix}\begin{bmatrix}3.21 & -7.25 & -2.26\end{bmatrix}\begin{bmatrix}1.65 & 1.21 & -5.78\end{bmatrix}\begin{bmatrix}1.26 & -5.3 & -1.48\end{bmatrix}\begin{bmatrix}2.04$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

326. Ray R has starting point e=$\begin{bmatrix}6.31 & 5.01 & -1.02\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.89 & -0.45 & -0.0\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}7.37 & 4.0 & 0.0\end{bmatrix}\begin{bmatrix}1.55 & 4.0 & 0.0\end{bmatrix}\begin{bmatrix}2.0 & 1.76 & -4.47\end{bmatrix}\begin{bmatrix}6.02 & 2.21 & -3.58\end{bmatrix}\begin{bmatrix}-0.68 & 2.66$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

327. What are the barycentric coordinates of point P=$\begin{bmatrix}-12.62 & -2.56 & 1.0\end{bmatrix}$ with respect to triangle T with vertices 1.00 -3.00 2.00 -5.00 -5.00 3.00 4.00 1.00 -2.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}0.0 & 1.0 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}0.0 & 1.0 & 0.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}2.5 & 1.0 & 2.5\end{bmatrix}$, what is P's color?

328. Ray R has starting point e=$\begin{bmatrix}-3.49 & -2.21 & 2.03\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.33 & 0.67 & -0.67\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}4.0 & -4.13 & -6.13\end{bmatrix}\begin{bmatrix}4.7 & -3.44 & -5.26\end{bmatrix}\begin{bmatrix}10.27 & -1.0 & -1.43\end{bmatrix}\begin{bmatrix}-1.57 & 1.79 & -1.61\end{bmatrix}$
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?

329. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 0) in a 741 x 302 image with the following parameters? l=0, r=4, b=1, t=4 view type = perspective camera origin = $\begin{bmatrix}-3.0 & 2.0 & 1.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.3 & 0.9 & 0.3\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.0 & -0.71 & 0.71\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.67 & -0.33 & 0.67\end{bmatrix}$

330. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 3) in a 717 x 435 image with the following parameters? l=-4, r=-3, b=1, t=4 view type = perspective camera origin = $\begin{bmatrix}-1.0 & -4.0 & -3.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.32 & 0.95 & 0.0\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.58 & -0.58 & 0.58\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.3 & 0.3 & -0.9\end{bmatrix}$

331. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 0) in a 636 x 342 image with the following parameters? l=-1, r=1, b=0, t=4 view type = perspective camera origin = $\begin{bmatrix}-3.0 & 0.0 & 1.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.76 & 0.46 & -0.46\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.32 & 0.49 & -0.81\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.0 & 0.89 & 0.45\end{bmatrix}$

332. What are the barycentric coordinates of point P=$\begin{bmatrix}-12.01 & -0.41 & 1.0\end{bmatrix}$ with respect to triangle T with vertices -5.00 0.00 -1.00 2.00 0.00 -4.00 1.00 -5.00 2.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.5 & 1.0 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}0.0 & 5.0 & 1.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}0.0 & 1.0 & 0.7\end{bmatrix}$, what is P's color?

333. Ray R has starting point e=$\begin{bmatrix}-7.76 & 1.6 & 3.88\end{bmatrix}$ and direction d=$\begin{bmatrix}0.65 & 0.65 & -0.39\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}3.47 & 1.88 & -4.12\end{bmatrix}\begin{bmatrix}1.35 & 1.35 & -6.24\end{bmatrix}\begin{bmatrix}2.41 & 6.25 & -1.47\end{bmatrix}\begin{bmatrix}4.26 & 7.05 & 0.65\end{bmatrix}\begin{bmatrix}4.0 & 5.32$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

334. What are the A, B, and C components of the line passing through $\begin{bmatrix}2.0 & -2.0 & 3.0\end{bmatrix}$ and $\begin{bmatrix}4.0 & -3.0 & -1.0\end{bmatrix}$, where Ax + By + C = 0

335. Ray R has starting point e=$\begin{bmatrix}7.07 & -1.36 & 0.52\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.58 & -0.58 & -0.58\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}6.57 & -1.68 & -1.92\end{bmatrix}\begin{bmatrix}6.24 & -3.78 & 1.81\end{bmatrix}\begin{bmatrix}5.92 & -2.0 & -0.95\end{bmatrix}\begin{bmatrix}7.87 & -1.03 & -3.87\end{bmatrix}$
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?

336. What are the barycentric coordinates of point P=$\begin{bmatrix}0.01 & -1.46 & -2.23\end{bmatrix}$ with respect to triangle T with vertices 3.00 1.00 -1.00 0.00 1.00 -1.00 -1.00 -3.00 -3.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}0.3 & 0.7 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.3 & 1.0 & 0.3\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.0 & 1.0 & 0.0\end{bmatrix}$, what is P's color?

337. Triangle T has vertices p0=$\begin{bmatrix}-7.5 & -4.12 & -0.31\end{bmatrix}$, p1=$\begin{bmatrix}-3.13 & 1.34 & -3.9\end{bmatrix}$, p2=$\begin{bmatrix}-6.87 & -3.34 & -1.09\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-6.15 & -0.36 & -3.65\end{bmatrix}$ and direction d=$\begin{bmatrix}0.49 & -0.49 & 0.73\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

338. Ray R has starting point e=$\begin{bmatrix}-5.74 & -3.71 & -1.17\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.51 & 0.17 & 0.85\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-4.61 & -6.15 & -2.03\end{bmatrix}\begin{bmatrix}-1.7 & -2.51 & -1.54\end{bmatrix}\begin{bmatrix}-5.34 & -6.88 & -2.03\end{bmatrix}\begin{bmatrix}1.21 & -1.06$
b) What is the normal to P?

c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection 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. Triangle T has vertices p0=$\begin{bmatrix}-2.4 & -3.6 & 1.2\end{bmatrix}$, p1=$\begin{bmatrix}0.0 & -4.8 & -0.4\end{bmatrix}$, p2=$\begin{bmatrix}3.8 & -4.8 & -0.4\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-4.65 & -3.29 & -0.5\end{bmatrix}$ and direction d=$\begin{bmatrix}0.91 & -0.18 & 0.37\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

340. What are the A, B, and C components of the line passing through $\begin{bmatrix}-5.0 & 1.0 & -5.0\end{bmatrix}$ and $\begin{bmatrix}-2.0 & -5.0 & -4.0\end{bmatrix}$, where Ax + By + C = 0

341. What are the A, B, and C components of the line passing through $\begin{bmatrix}-4.0 & -3.0 & -5.0\end{bmatrix}$ and $\begin{bmatrix}-1.0 & 0.0 & -1.0\end{bmatrix}$, where Ax + By + C = 0

342. Triangle T has vertices p0=$\begin{bmatrix}1.12 & -2.88 & -1.59\end{bmatrix}$, p1=$\begin{bmatrix}-3.12 & -7.12 & -5.83\end{bmatrix}$, p2=$\begin{bmatrix}0.41 & -3.59 & -8.66\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}0.18 & -3.82 & -4.12\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.27 & 0.53 & -0.8\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

343. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 3) in a 554 x 604 image with the following parameters? l=-4, r=2, b=-4, t=4 view type = perspective camera origin = $\begin{bmatrix}3.0 & -3.0 & -5.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.37 & -0.93 & 0.0\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.67 & -0.33 & -0.67\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.69 & 0.69 & -0.23\end{bmatrix}$

344. What are the barycentric coordinates of point P=$\begin{bmatrix}1.22 & -1.75 & -2.62\end{bmatrix}$ with respect to triangle T with vertices 4.00 0.00 -5.00 1.00 -4.00 2.00 -3.00 -3.00 -2.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.0 & 5.0 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 1.2 & 1.2\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.0 & 0.7 & 0.3\end{bmatrix}$, what is P's color?

345. Ray R has starting point e=$\begin{bmatrix}-13.51 & -5.58 & -2.91\end{bmatrix}$ and direction d=$\begin{bmatrix}0.53 & 0.66 & 0.53\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}0.61 & -5.69 & 4.38\end{bmatrix}\begin{bmatrix}-1.69 & -5.0 & 2.31\end{bmatrix}\begin{bmatrix}-1.92 & -2.94 & 2.77\end{bmatrix}\begin{bmatrix}-1.92 & -0.18 & 3.69\end{bmatrix}$
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?

346. What are the barycentric coordinates of point P=$\begin{bmatrix}-11.39 & 2.39 & 1.0\end{bmatrix}$ with respect to triangle T with vertices -5.00 0.00 -5.00 3.00 4.00 2.00 -1.00 -1.00 4.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}0.0 & 2.0 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 1.0 & 1.3\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}2.5 & 1.0 & 0.5\end{bmatrix}$, what is P's color?

347. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 1) in a 717 x 462 image with the following parameters? l=-5, r=1, b=1, t=2 view type = perspective camera origin = $\begin{bmatrix}0.0 & -1.0 & -5.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.69 & -0.69 & -0.23\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.69 & 0.23 & -0.69\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.71 & 0.0 & -0.71\end{bmatrix}$

348. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 2) in a 567 x 394 image with the following parameters? l=-3, r=2, b=1, t=2 view type = orthographic camera origin = $\begin{bmatrix}-1.0 & -2.0 & -1.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.7 & -0.7 & 0.17\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.7 & -0.17 & 0.7\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.78 & -0.62 & 0.0\end{bmatrix}$

349. What are the barycentric coordinates of point P=$\begin{bmatrix}0.32 & -1.87 & 2.68\end{bmatrix}$ with respect to triangle T with vertices 1.00 -2.00 4.00 1.00 -5.00 -2.00 -2.00 0.00 1.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.0 & 1.0 & 3.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}2.0 & 0.0 & 1.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}0.8 & 0.2 & 1.0\end{bmatrix}$, what is P's color?

350. What are the A, B, and C components of the line passing through $\begin{bmatrix}-4.0 & -5.0 & -5.0\end{bmatrix}$ and $\begin{bmatrix}-5.0 & -4.0 & -2.0\end{bmatrix}$, where Ax + By + C = 0

351. What are the A, B, and C components of the line passing through $\begin{bmatrix}1.0 & -1.0 & -3.0\end{bmatrix}$ and $\begin{bmatrix}-5.0 & 3.0 & 0.0\end{bmatrix}$, where Ax + By + C = 0

352. Ray R has starting point e=$\begin{bmatrix}-6.65 & -1.8 & 3.75\end{bmatrix}$ and direction d=$\begin{bmatrix}0.51 & -0.51 & -0.69\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}9.72 & -5.22 & -1.73\end{bmatrix}\begin{bmatrix}7.67 & -4.82 & -2.96\end{bmatrix}\begin{bmatrix}6.04 & -2.37 & 0.31\end{bmatrix}\begin{bmatrix}3.18 & -6.45 & -10.7$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection 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. Ray R has starting point e=$\begin{bmatrix}1.8 & 7.83 & 6.27\end{bmatrix}$ and direction d=$\begin{bmatrix}0.75 & -0.6 & 0.3\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}4.15 & 5.15 & 6.31\end{bmatrix}\begin{bmatrix}1.85 & 8.04 & 6.89\end{bmatrix}\begin{bmatrix}7.04 & 3.42 & 7.46\end{bmatrix}\begin{bmatrix}4.73 & 5.15 & 6.89\end{bmatrix}\begin{bmatrix}3.0 & 2.27 & 2.27\end{bmatrix}$.
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?

354. Triangle T has vertices p0=$\begin{bmatrix}5.39 & 2.7 & -0.78\end{bmatrix}$, p1=$\begin{bmatrix}2.61 & 6.87 & -4.61\end{bmatrix}$, p2=$\begin{bmatrix}6.61 & 2.0 & 0.61\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-2.93 & 5.87 & 0.44\end{bmatrix}$ and direction d=$\begin{bmatrix}0.67 & -0.67 & 0.33\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

355. What are the A, B, and C components of the line passing through $\begin{bmatrix}0.0 & -1.0 & 0.0\end{bmatrix}$ and $\begin{bmatrix}2.0 & -3.0 & -5.0\end{bmatrix}$, where Ax + By + C = 0

356. What are the barycentric coordinates of point P=$\begin{bmatrix}-3.06 & 0.72 & -0.62\end{bmatrix}$ with respect to triangle T with vertices -5.00 1.00 -5.00 4.00 -1.00 4.00 -3.00 1.00 4.00?
b) Is point P inside or outside T?

c) If vertex 0 has color $\begin{bmatrix}5.0 & 1.0 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}2.0 & 1.0 & 1.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}2.5 & 1.0 & 0.5\end{bmatrix}$, what is P's color?

357. Ray R has starting point e=$\begin{bmatrix}-4.79 & 5.87 & 1.33\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.0 & -0.45 & 0.89\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-5.97 & 1.79 & -1.88\end{bmatrix}\begin{bmatrix}-4.51 & 5.67 & 3.94\end{bmatrix}\begin{bmatrix}-5.24 & 4.46 & 1.03\end{bmatrix}\begin{bmatrix}-5.97 & -1.85 & -1.88\end{bmatrix}\begin{bmatrix}-4$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

358. What are the A, B, and C components of the line passing through $\begin{bmatrix}-5.0 & 1.0 & 0.0\end{bmatrix}$ and $\begin{bmatrix}2.0 & -3.0 & -5.0\end{bmatrix}$, where Ax + By + C = 0

359. What are the A, B, and C components of the line passing through $\begin{bmatrix}-3.0 & 4.0 & 0.0\end{bmatrix}$ and $\begin{bmatrix}0.0 & 4.0 & 0.0\end{bmatrix}$, where Ax + By + C = 0

360. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 4) in a 416 x 714 image with the following parameters? l=-2, r=3, b=-5, t=-2 view type = orthographic camera origin = $\begin{bmatrix}-3.0 & 2.0 & 2.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.35 & -0.87 & 0.35\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.71 & -0.71 & 0.0\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.56 & -0.37 & 0.74\end{bmatrix}$

361. Triangle T has vertices p0=$\begin{bmatrix}2.0 & 2.17 & -2.0\end{bmatrix}$, p1=$\begin{bmatrix}2.55 & 9.1 & -1.17\end{bmatrix}$, p2=$\begin{bmatrix}1.45 & 0.78 & -2.83\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-2.52 & 2.01 & -3.32\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.19 & -0.19 & 0.96\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

362. What are the barycentric coordinates of point P=$\begin{bmatrix}-2.29 & -4.09 & 1.0\end{bmatrix}$ with respect to triangle T with vertices 1.00 -5.00 2.00 0.00 3.00 1.00 -2.00 3.00 -4.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}0.5 & 0.8 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}2.0 & 0.0 & 1.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}5.0 & 1.0 & 1.0\end{bmatrix}$, what is P's color?

363. What are the barycentric coordinates of point P=$\begin{bmatrix}-10.96 & -2.31 & 1.0\end{bmatrix}$ with respect to triangle T with vertices 4.00 0.00 2.00 -4.00 1.00 -4.00 2.00 -4.00 2.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.3 & 1.7 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}2.0 & 5.0 & 1.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}2.5 & 1.0 & 1.0\end{bmatrix}$, what is P's color?

364. What are the barycentric coordinates of point P=$\begin{bmatrix}-2.66 & 3.59 & -3.06\end{bmatrix}$ with respect to triangle T with vertices 1.00 4.00 -5.00 -3.00 4.00 -4.00 -3.00 2.00 1.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}0.0 & 1.0 & 0.5\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}0.5 & 1.0 & 0.5\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}4.0 & 1.0 & 5.0\end{bmatrix}$, what is P's color?

365. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 3) in a 656 x 394 image with the following parameters? l=-2, r=4, b=-3, t=3 view type = perspective camera origin = $\begin{bmatrix}2.0 & -3.0 & -4.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.2 & 0.59 & 0.78\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.71 & -0.71 & 0.0\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.86 & 0.0 & -0.51\end{bmatrix}$

366. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 3) in a 578 x 745 image with the following parameters? l=-3, r=3, b=-3, t=0 view type = perspective camera origin = $\begin{bmatrix}-1.0 & -1.0 & 0.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.3 & -0.9 & -0.3\end{bmatrix}$ camera v axis = $\begin{bmatrix}-1.0 & 0.0 & 0.0\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.0 & -0.71 & 0.71\end{bmatrix}$

367. What are the barycentric coordinates of point P=$\begin{bmatrix}-8.36 & -2.75 & 1.0\end{bmatrix}$ with respect to triangle T with vertices -2.00 -1.00 -2.00 1.00 -4.00 1.00 -4.00 -5.00 -1.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}0.3 & 1.0 & 0.3\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.7 & 1.0 & 1.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}5.0 & 4.0 & 1.0\end{bmatrix}$, what is P's color?

368. Triangle T has vertices p0=$\begin{bmatrix}0.29 & -1.03 & 7.83\end{bmatrix}$, p1=$\begin{bmatrix}3.71 & 1.03 & 5.77\end{bmatrix}$, p2=$\begin{bmatrix}2.86 & 0.51 & 8.86\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-0.18 & 0.84 & 6.03\end{bmatrix}$ and direction d=$\begin{bmatrix}1.0 & -0.0 & -0.0\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

369. Triangle T has vertices p0=$\begin{bmatrix}3.7 & 4.87 & -2.7\end{bmatrix}$, p1=$\begin{bmatrix}3.0 & 3.65 & -0.61\end{bmatrix}$, p2=$\begin{bmatrix}4.22 & 5.22 & -2.0\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-3.3 & 3.15 & 1.0\end{bmatrix}$ and direction d=$\begin{bmatrix}0.83 & 0.55 & -0.0\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

370. Triangle T has vertices p0=$\begin{bmatrix}-2.18 & 1.48 & 0.32\end{bmatrix}$, p1=$\begin{bmatrix}-3.87 & 4.01 & 2.18\end{bmatrix}$, p2=$\begin{bmatrix}3.23 & 7.23 & 2.69\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-10.32 & 0.41 & 1.59\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.37 & 0.91 & -0.18\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

371. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 0) in a 329 x 488 image with the following parameters? l=0, r=1, b=-5, t=-4 view type = perspective camera origin = $\begin{bmatrix}-4.0 & -4.0 & -1.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.37 & 0.74 & -0.56\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.78 & -0.59 & 0.2\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.71 & 0.0 & -0.71\end{bmatrix}$

372. What are the A, B, and C components of the line passing through $\begin{bmatrix}-4.0 & -5.0 & -1.0\end{bmatrix}$ and $\begin{bmatrix}0.0 & 1.0 & 0.0\end{bmatrix}$, where Ax + By + C = 0

373. Triangle T has vertices p0=$\begin{bmatrix}-3.42 & 5.73 & -0.15\end{bmatrix}$, p1=$\begin{bmatrix}-1.11 & 6.89 & 1.0\end{bmatrix}$, p2=$\begin{bmatrix}-1.11 & 3.42 & 4.46\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}0.5 & 6.09 & 1.62\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.87 & -0.44 & 0.22\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

374. What are the A, B, and C components of the line passing through $\begin{bmatrix}1.0 & -4.0 & -1.0\end{bmatrix}$ and $\begin{bmatrix}1.0 & -2.0 & -4.0\end{bmatrix}$, where Ax + By + C = 0

375. What are the barycentric coordinates of point P=$\begin{bmatrix}-11.38 & 3.45 & 1.0\end{bmatrix}$ with respect to triangle T with vertices -4.00 3.00 4.00 -1.00 4.00 -2.00 -4.00 -2.00 -4.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}3.0 & 1.0 & 3.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 0.2 & 0.2\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.0 & 1.0 & 1.0\end{bmatrix}$, what is P's color?

376. Ray R has starting point e=$\begin{bmatrix}-8.8 & 2.01 & -2.94\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.62 & -0.15 & 0.77\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}1.0 & 2.41 & -1.22\end{bmatrix}\begin{bmatrix}-4.49 & 3.98 & -5.14\end{bmatrix}\begin{bmatrix}2.96 & 6.14 & -5.53\end{bmatrix}\begin{bmatrix}-1.75 & 0.84 & -0.04\end{bmatrix}[-$
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?

377. What are the barycentric coordinates of point P=$\begin{bmatrix}-1.05 & 0.02 & -0.26\end{bmatrix}$ with respect to triangle T with vertices 2.00 1.00 2.00 -5.00 -2.00 1.00 0.00 1.00 -3.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}4.0 & 2.0 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 1.7 & 1.3\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}2.0 & 0.5 & 1.0\end{bmatrix}$, what is P's color?

378. Ray R has starting point e=$\begin{bmatrix}-11.75 & 5.37 & 4.52\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.56 & -0.37 & -0.74\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-6.18 & 4.21 & -8.72\end{bmatrix}\begin{bmatrix}-3.48 & -2.38 & -2.46\end{bmatrix}\begin{bmatrix}-6.18 & 2.01 & -2.13\end{bmatrix}\begin{bmatrix}-2.63 & -2.04 & -$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

379. Triangle T has vertices p0=$\begin{bmatrix}3.98 & 2.75 & -4.9\end{bmatrix}$, p1=$\begin{bmatrix}3.78 & 4.71 & -3.92\end{bmatrix}$, p2=$\begin{bmatrix}3.2 & -1.96 & -0.98\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}3.95 & 3.75 & -3.94\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.8 & 0.53 & 0.27\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

380. Ray R has starting point e=$\begin{bmatrix}-0.72 & 3.65 & -1.67\end{bmatrix}$ and direction d=$\begin{bmatrix}0.47 & 0.62 & -0.62\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-1.6 & 4.2 & -1.8\end{bmatrix}\begin{bmatrix}-1.6 & 1.0 & -1.8\end{bmatrix}\begin{bmatrix}2.4 & 7.4 & -4.8\end{bmatrix}\begin{bmatrix}3.2 & 7.6 & -5.4\end{bmatrix}\begin{bmatrix}-0.8 & 5.4 & -2$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection 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 A, B, and C components of the line passing through $\begin{bmatrix}3.0 & -5.0 & -1.0\end{bmatrix}$ and $\begin{bmatrix}-1.0 & 4.0 & -2.0\end{bmatrix}$, where Ax + By + C = 0

382. Ray R has starting point e=$\begin{bmatrix}-9.32 & 1.14 & 1.82\end{bmatrix}$ and direction d=$\begin{bmatrix}0.78 & -0.0 & -0.62\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-1.86 & 1.22 & 6.04\end{bmatrix}\begin{bmatrix}2.22 & 3.67 & 5.22\end{bmatrix}\begin{bmatrix}2.22 & -1.22 & 2.78\end{bmatrix}\begin{bmatrix}-1.04 & 1.22 & 5.63\end{bmatrix}\begin{bmatrix}-2.67 & 2.0$
b) What is the normal to P?
c) What is the t intersection point of R and P?

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

383. Ray R has starting point e=$\begin{bmatrix}-9.54 & -3.33 & -0.05\end{bmatrix}$ and direction d=$\begin{bmatrix}0.23 & -0.69 & 0.69\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}3.27 & -5.63 & -0.45\end{bmatrix}\begin{bmatrix}0.82 & -5.63 & 0.78\end{bmatrix}\begin{bmatrix}3.27 & -6.45 & -0.86\end{bmatrix}\begin{bmatrix}0.82 & -2.37 & 2.41\end{bmatrix}[$
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?

384. What are the A, B, and C components of the line passing through $\begin{bmatrix}-3.0 & -4.0 & 4.0\end{bmatrix}$ and $\begin{bmatrix}-3.0 & 0.0 & 3.0\end{bmatrix}$, where Ax + By + C = 0

385. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 1) in a 569 x 514 image with the following parameters? l=0, r=2, b=-4, t=-2 view type = perspective camera origin = $\begin{bmatrix}2.0 & -3.0 & -4.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.62 & -0.77 & -0.15\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.91 & -0.18 & -0.37\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.0 & 0.37 & -0.93\end{bmatrix}$

386. What are the barycentric coordinates of point P=$\begin{bmatrix}-14.49 & -1.93 & 1.0\end{bmatrix}$ with respect to triangle T with vertices 4.00 -2.00 3.00 -5.00 -1.00 2.00 -5.00 3.00 2.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}2.0 & 5.0 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 3.0 & 1.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}0.7 & 1.0 & 0.7\end{bmatrix}$, what is P's color?

387. Ray R has starting point e=$\begin{bmatrix}-10.32 & 0.32 & -1.84\end{bmatrix}$ and direction d=$\begin{bmatrix}0.49 & 0.49 & 0.73\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-4.38 & -4.62 & 3.59\end{bmatrix}\begin{bmatrix}-0.94 & -3.37 & -0.78\end{bmatrix}\begin{bmatrix}-3.13 & -4.62 & 2.34\end{bmatrix}\begin{bmatrix}-5.0 & 5.37 & -3.28\end{bmatrix}[$
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?

388. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 0) in a 282 x 709 image with the following parameters? l=1, r=4, b=-2, t=2 view type = orthographic camera origin = $\begin{bmatrix}-1.0 & 0.0 & -1.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.64 & 0.64 & 0.43\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.2 & 0.0 & -0.98\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.37 & 0.74 & -0.56\end{bmatrix}$

389. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 4) in a 474 x 351 image with the following parameters? l=-1, r=2, b=3, t=4 view type = perspective camera origin = $\begin{bmatrix}-1.0 & 3.0 & 0.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.65 & -0.65 & 0.39\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.22 & 0.87 & -0.44\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.49 & -0.62 & -0.62\end{bmatrix}$

390. What are the A, B, and C components of the line passing through $\begin{bmatrix}2.0 & 3.0 & 0.0\end{bmatrix}$ and $\begin{bmatrix}-1.0 & 4.0 & -2.0\end{bmatrix}$, where Ax + By + C = 0

391. What are the A, B, and C components of the line passing through $\begin{bmatrix}1.0 & -5.0 & 1.0\end{bmatrix}$ and $\begin{bmatrix}3.0 & 2.0 & 0.0\end{bmatrix}$, where Ax + By + C = 0

392. What are the A, B, and C components of the line passing through $\begin{bmatrix}0.0 & -4.0 & -5.0\end{bmatrix}$ and $\begin{bmatrix}-5.0 & 2.0 & 1.0\end{bmatrix}$, where Ax + By + C = 0

393. Triangle T has vertices p0=$\begin{bmatrix}-0.06 & -4.12 & 5.42\end{bmatrix}$, p1=$\begin{bmatrix}4.89 & -0.35 & -4.71\end{bmatrix}$, p2=$\begin{bmatrix}3.24 & -3.18 & 4.95\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}2.33 & -2.47 & -0.63\end{bmatrix}$ and direction d=$\begin{bmatrix}0.62 & 0.47 & -0.62\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

394. What are the barycentric coordinates of point P=$\begin{bmatrix}-3.32 & -1.83 & -2.35\end{bmatrix}$ with respect to triangle T with vertices -4.00 -2.00 -4.00 -2.00 -2.00 1.00 -2.00 2.00 0.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}0.2 & 0.8 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 1.3 & 0.3\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.3 & 1.0 & 1.7\end{bmatrix}$, what is P's color?

395. Ray R has starting point e=$\begin{bmatrix}-6.63 & -1.55 & -3.7\end{bmatrix}$ and direction d=$\begin{bmatrix}0.57 & 0.42 & 0.71\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-8.71 & -0.93 & -2.84\end{bmatrix}\begin{bmatrix}-0.42 & 2.56 & 2.18\end{bmatrix}\begin{bmatrix}-3.69 & -1.36 & -0.44\end{bmatrix}\begin{bmatrix}-7.4 & 7.8 & 0.0\end{bmatrix}\begin{bmatrix}-1.5$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection 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. What are the barycentric coordinates of point P=$\begin{bmatrix}-7.51 & -0.2 & 1.0\end{bmatrix}$ with respect to triangle T with vertices 4.00 4.00 2.00 3.00 -3.00 -4.00 -5.00 4.00 1.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.0 & 1.0 & 1.2\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 0.2 & 0.8\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.0 & 0.0 & 0.7\end{bmatrix}$, what is P's color?

397. Triangle T has vertices p0=$\begin{bmatrix}4.04 & -5.58 & -2.62\end{bmatrix}$, p1=$\begin{bmatrix}0.0 & -6.73 & 0.27\end{bmatrix}$, p2=$\begin{bmatrix}2.31 & -5.0 & -0.31\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}1.14 & -7.43 & -1.08\end{bmatrix}$ and direction d=$\begin{bmatrix}0.69 & 0.69 & -0.23\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

398. Ray R has starting point e=$\begin{bmatrix}5.33 & 4.18 & -0.41\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.24 & -0.0 & 0.97\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}3.42 & 3.42 & -1.31\end{bmatrix}\begin{bmatrix}5.54 & 3.81 & -1.5\end{bmatrix}\begin{bmatrix}7.46 & 5.54 & 5.23\end{bmatrix}\begin{bmatrix}3.04 & 3.81 & 1.0\end{bmatrix}\begin{bmatrix}1.88 & 3.23 & -$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection 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 (0, 2) in a 332 x 367 image with the following parameters? l=-5, r=3, b=2, t=4 view type = perspective camera origin = $\begin{bmatrix}4.0 & 1.0 & 2.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.69 & -0.69 & -0.23\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.91 & -0.18 & 0.37\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.66 & -0.53 & -0.53\end{bmatrix}$

400. What are the barycentric coordinates of point P=$\begin{bmatrix}-3.81 & 1.25 & -0.12\end{bmatrix}$ with respect to triangle T with vertices -3.00 0.00 0.00 -4.00 2.00 0.00 -4.00 -4.00 -2.00?
b) Is point P inside or outside T?

c) If vertex 0 has color $\begin{bmatrix}0.3 & 1.0 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.7 & 0.7 & 1.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}0.8 & 0.8 & 1.0\end{bmatrix}$, what is P's color?

401. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 3) in a 601 x 742 image with the following parameters? l=2, r=3, b=-5, t=-1 view type = orthographic camera origin = $\begin{bmatrix}4.0 & -4.0 & 3.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.0 & -0.37 & -0.93\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.42 & -0.57 & -0.71\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.78 & 0.0 & 0.62\end{bmatrix}$

402. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 0) in a 367 x 271 image with the following parameters? l=-2, r=-1, b=-3, t=2 view type = orthographic camera origin = $\begin{bmatrix}-5.0 & -5.0 & -2.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.59 & -0.2 & -0.78\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.82 & -0.41 & -0.41\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.62 & -0.49 & -0.62\end{bmatrix}$

403. Triangle T has vertices p0=$\begin{bmatrix}-5.26 & 5.09 & -0.99\end{bmatrix}$, p1=$\begin{bmatrix}-5.69 & 4.1 & 0.28\end{bmatrix}$, p2=$\begin{bmatrix}-4.7 & -1.13 & 2.97\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-16.03 & 3.68 & 1.61\end{bmatrix}$ and direction d=$\begin{bmatrix}0.94 & 0.24 & -0.24\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

404. Triangle T has vertices p0=$\begin{bmatrix}3.57 & -7.92 & -3.33\end{bmatrix}$, p1=$\begin{bmatrix}0.23 & -2.23 & 1.77\end{bmatrix}$, p2=$\begin{bmatrix}7.49 & -1.65 & 0.39\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-5.44 & -2.08 & 3.55\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.0 & -0.71 & -0.71\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

405. Ray R has starting point e=$\begin{bmatrix}-3.16 & 1.54 & -4.83\end{bmatrix}$ and direction d=$\begin{bmatrix}0.67 & -0.33 & 0.67\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-1.55 & 2.5 & -2.34\end{bmatrix}\begin{bmatrix}-2.39 & 0.83 & -3.45\end{bmatrix}\begin{bmatrix}-1.0 & 0.0 & -4.0\end{bmatrix}\begin{bmatrix}-3.22 & 0.0 & -4.0\end{bmatrix}\begin{bmatrix}2.61$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection 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 A, B, and C components of the line passing through $\begin{bmatrix}-3.0 & 1.0 & 0.0\end{bmatrix}$ and $\begin{bmatrix}-3.0 & -4.0 & 2.0\end{bmatrix}$, where Ax + By + C = 0

407. Triangle T has vertices p0=$\begin{bmatrix}-2.04 & 2.22 & -3.61\end{bmatrix}$, p1=$\begin{bmatrix}-2.04 & 3.98 & -5.96\end{bmatrix}$, p2=$\begin{bmatrix}-2.43 & 5.55 & -7.92\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-14.73 & 3.7 & -0.35\end{bmatrix}$ and direction d=$\begin{bmatrix}0.87 & 0.35 & 0.35\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

408. Triangle T has vertices p0=$\begin{bmatrix}1.54 & -7.54 & 0.07\end{bmatrix}$, p1=$\begin{bmatrix}-3.2 & -6.35 & -3.48\end{bmatrix}$, p2=$\begin{bmatrix}0.35 & -3.31 & -7.37\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-9.79 & -4.53 & 1.56\end{bmatrix}$ and direction d=$\begin{bmatrix}0.91 & -0.18 & -0.37\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

409. What are the barycentric coordinates of point P=$\begin{bmatrix}-8.95 & -1.14 & 1.0\end{bmatrix}$ with respect to triangle T with vertices -1.00 3.00 -5.00 -5.00 2.00 2.00 -4.00 -3.00 4.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.0 & 0.0 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 1.0 & 1.7\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}0.8 & 0.8 & 1.0\end{bmatrix}$, what is P's color?

410. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 3) in a 707 x 729 image with the following parameters? l=1, r=4, b=-3, t=-1 view type = orthographic camera origin = $\begin{bmatrix}-4.0 & -4.0 & -2.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.51 & -0.69 & 0.51\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.8 & 0.27 & 0.53\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.18 & -0.91 & 0.37\end{bmatrix}$

411. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 1) in a 262 x 374 image with the following parameters? l=-4, r=0, b=-5, t=4 view type = perspective camera origin = $\begin{bmatrix}2.0 & 0.0 & -3.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.64 & 0.43 & -0.64\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.71 & 0.0 & 0.71\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.57 & -0.71 & 0.42\end{bmatrix}$

412. Triangle T has vertices p0=$\begin{bmatrix}-0.48 & -2.62 & 6.06\end{bmatrix}$, p1=$\begin{bmatrix}-0.25 & -4.69 & 6.98\end{bmatrix}$, p2=$\begin{bmatrix}-3.69 & -0.56 & 2.16\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-10.65 & -2.51 & 0.1\end{bmatrix}$ and direction d=$\begin{bmatrix}0.58 & 0.58 & 0.58\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

413. Triangle T has vertices p0=$\begin{bmatrix}-0.83 & 4.83 & -1.71\end{bmatrix}$, p1=$\begin{bmatrix}1.29 & 2.71 & -1.0\end{bmatrix}$, p2=$\begin{bmatrix}5.54 & -1.54 & -7.36\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-3.71 & 4.42 & 1.0\end{bmatrix}$ and direction d=$\begin{bmatrix}0.71 & -0.71 & -0.0\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

414. What are the A, B, and C components of the line passing through $\begin{bmatrix}-1.0 & -1.0 & 0.0\end{bmatrix}$ and $\begin{bmatrix}3.0 & 3.0 & -3.0\end{bmatrix}$, where Ax + By + C = 0

415. What are the barycentric coordinates of point P=$\begin{bmatrix}1.32 & 1.21 & 0.72\end{bmatrix}$ with respect to triangle T with vertices 1.00 0.00 4.00 2.00 2.00 0.00 -5.00 -4.00 0.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.0 & 1.5 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 1.0 & 1.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}3.0 & 1.0 & 3.0\end{bmatrix}$, what is P's color?

416. What are the A, B, and C components of the line passing through $\begin{bmatrix}-2.0 & 4.0 & 3.0\end{bmatrix}$ and $\begin{bmatrix}3.0 & -3.0 & 2.0\end{bmatrix}$, where Ax + By + C = 0

417. Triangle T has vertices p0=$\begin{bmatrix}-2.56 & 2.49 & 0.62\end{bmatrix}$, p1=$\begin{bmatrix}-4.75 & 2.06 & -3.96\end{bmatrix}$, p2=$\begin{bmatrix}-4.96 & 1.62 & -4.62\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-6.77 & -1.66 & -5.6\end{bmatrix}$ and direction d=$\begin{bmatrix}0.49 & 0.62 & 0.62\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

418. Ray R has starting point e=$\begin{bmatrix}-4.97 & -3.87 & -3.16\end{bmatrix}$ and direction d=$\begin{bmatrix}0.58 & 0.58 & -0.58\end{bmatrix}$.
Polygon P has vertices $\begin{bmatrix}-4.8 & -3.8 & -4.6\end{bmatrix}\begin{bmatrix}-4.8 & -0.6 & -2.2\end{bmatrix}\begin{bmatrix}-3.0 & -5.4 & -5.8\end{bmatrix}\begin{bmatrix}-4.4 & -0.6 & -2.2\end{bmatrix}\begin{bmatrix}-3.$

b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection 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. Ray R has starting point e=$\begin{bmatrix}-2.35 & 3.81 & -2.13\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.67 & -0.33 & 0.67\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-1.65 & 3.0 & 0.39\end{bmatrix}\begin{bmatrix}-0.61 & 4.22 & -0.3\end{bmatrix}\begin{bmatrix}-4.79 & 0.91 & -3.79\end{bmatrix}\begin{bmatrix}1.66 & 6.31 & 0.39\end{bmatrix}\begin{bmatrix}-2.8$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

420. What are the barycentric coordinates of point P=$\begin{bmatrix}1.99 & -1.9 & -3.27\end{bmatrix}$ with respect to triangle T with vertices -5.00 -3.00 0.00 2.00 1.00 -5.00 3.00 -3.00 -3.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.0 & 4.0 & 0.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}4.0 & 1.0 & 1.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.3 & 1.0 & 1.3\end{bmatrix}$, what is P's color?

421. What are the barycentric coordinates of point P=$\begin{bmatrix}0.5 & -3.2 & -0.6\end{bmatrix}$ with respect to triangle T with vertices 4.00 1.00 2.00 4.00 -5.00 -1.00 -3.00 -3.00 -1.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.0 & 0.5 & 0.5\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.5 & 1.0 & 2.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}4.0 & 1.0 & 4.0\end{bmatrix}$, what is P's color?

422. What are the A, B, and C components of the line passing through $\begin{bmatrix}3.0 & 2.0 & 1.0\end{bmatrix}$ and $\begin{bmatrix}-4.0 & -5.0 & -5.0\end{bmatrix}$, where Ax + By + C = 0

423. Triangle T has vertices p0=$\begin{bmatrix}3.55 & 0.45 & -5.55\end{bmatrix}$, p1=$\begin{bmatrix}-3.71 & 0.65 & -0.06\end{bmatrix}$, p2=$\begin{bmatrix}-0.96 & -0.53 & -2.41\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-7.08 & -0.05 & 1.51\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.71 & -0.0 & -0.71\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

424. What are the A, B, and C components of the line passing through $\begin{bmatrix}-3.0 & 3.0 & -3.0\end{bmatrix}$ and $\begin{bmatrix}-1.0 & -4.0 & 2.0\end{bmatrix}$, where Ax + By + C = 0

425. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 0) in a 741 x 703 image with the following parameters? l=-5, r=0, b=-5, t=2 view type = orthographic camera origin = $\begin{bmatrix}-3.0 & -5.0 & -2.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.53 & 0.27 & 0.8\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.24 & 0.24 & 0.94\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.0 & 0.45 & -0.89\end{bmatrix}$

426. What are the A, B, and C components of the line passing through $\begin{bmatrix}-1.0 & 4.0 & 2.0\end{bmatrix}$ and $\begin{bmatrix}0.0 & -2.0 & 1.0\end{bmatrix}$, where Ax + By + C = 0

427. What are the A, B, and C components of the line passing through $\begin{bmatrix}2.0 & -3.0 & 3.0\end{bmatrix}$ and $\begin{bmatrix}3.0 & -5.0 & 3.0\end{bmatrix}$, where Ax + By + C = 0

428. Ray R has starting point e=$\begin{bmatrix}-14.96 & 1.63 & 0.29\end{bmatrix}$ and direction d=$\begin{bmatrix}0.67 & 0.67 & 0.33\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-4.71 & 4.47 & 0.7\end{bmatrix}\begin{bmatrix}-4.24 & 0.23 & 6.83\end{bmatrix}\begin{bmatrix}-3.06 & 7.3 & 4.47\end{bmatrix}\begin{bmatrix}-4.71 & 2.11 & 3.06\end{bmatrix}\begin{bmatrix}-3.06 & 1.8$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

429. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 1) in a 747 x 284 image with the following parameters? l=-3, r=-2, b=-5, t=2 view type = perspective camera origin = $\begin{bmatrix}1.0 & 3.0 & 1.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.94 & -0.24 & -0.24\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.0 & -0.93 & 0.37\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.82 & -0.41 & -0.41\end{bmatrix}$

430. What are the A, B, and C components of the line passing through $\begin{bmatrix}-2.0 & 1.0 & 4.0\end{bmatrix}$ and $\begin{bmatrix}1.0 & 4.0 & 2.0\end{bmatrix}$, where Ax + By + C = 0

431. What are the barycentric coordinates of point P=$\begin{bmatrix}-3.74 & -4.72 & 1.37\end{bmatrix}$ with respect to triangle T with vertices 3.00 -3.00 -4.00 -4.00 -5.00 -2.00 -5.00 -5.00 3.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.7 & 1.0 & 1.3\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 1.0 & 2.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}0.8 & 1.0 & 0.2\end{bmatrix}$, what is P's color?

432. What are the barycentric coordinates of point P=$\begin{bmatrix}1.61 & 0.3 & -2.64\end{bmatrix}$ with respect to triangle T with vertices 3.00 1.00 -3.00 -1.00 -1.00 -2.00 2.00 0.00 -1.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.2 & 1.2 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 1.7 & 0.7\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}0.7 & 0.3 & 1.0\end{bmatrix}$, what is P's color?

433. Triangle T has vertices p0=$\begin{bmatrix}-0.26 & -2.51 & 5.71\end{bmatrix}$, p1=$\begin{bmatrix}-0.07 & -6.6 & -0.04\end{bmatrix}$, p2=$\begin{bmatrix}-0.26 & -2.89 & 5.16\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-0.22 & -5.66 & 4.91\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.0 & 0.95 & -0.32\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

434. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 1) in a 699 x 687 image with the following parameters? l=0, r=4, b=-2, t=1 view type = orthographic camera origin = $\begin{bmatrix}3.0 & -2.0 & 0.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.74 & 0.56 & -0.37\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.82 & 0.41 & -0.41\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.56 & 0.74 & 0.37\end{bmatrix}$

435. Ray R has starting point e=$\begin{bmatrix}-3.65 & 4.38 & 0.84\end{bmatrix}$ and direction d=$\begin{bmatrix}1.0 & -0.0 & -0.0\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-2.25 & 0.46 & -2.98\end{bmatrix}\begin{bmatrix}-1.12 & 4.42 & 1.12\end{bmatrix}\begin{bmatrix}4.82 & 6.4 & -0.86\end{bmatrix}\begin{bmatrix}0.58 & 4.42 & -0.15\end{bmatrix}\begin{bmatrix}4.68 & 7.11$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

436. What are the barycentric coordinates of point P=$\begin{bmatrix}-1.65 & 1.07 & 0.4\end{bmatrix}$ with respect to triangle T with vertices 1.00 -1.00 4.00 -3.00 2.00 -1.00 4.00 -2.00 3.00?
b) Is point P inside or outside T?

c) If vertex 0 has color $\begin{bmatrix}3.0 & 3.0 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 1.7 & 1.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.0 & 1.0 & 1.0\end{bmatrix}$, what is P's color?

437. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 4) in a 741 x 370 image with the following parameters? l=0, r=3, b=-2, t=1 view type = orthographic camera origin = $\begin{bmatrix}0.0 & 3.0 & -3.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.17 & 0.7 & -0.7\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.24 & 0.94 & 0.24\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.69 & -0.23 & -0.69\end{bmatrix}$

438. What are the barycentric coordinates of point P=$\begin{bmatrix}-7.18 & 0.32 & 1.0\end{bmatrix}$ with respect to triangle T with vertices -3.00 -1.00 2.00 -2.00 0.00 1.00 3.00 1.00 -1.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.0 & 1.0 & 0.8\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}0.8 & 1.0 & 0.5\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.0 & 1.0 & 1.0\end{bmatrix}$, what is P's color?

439. Triangle T has vertices p0=$\begin{bmatrix}1.94 & -6.75 & -1.56\end{bmatrix}$, p1=$\begin{bmatrix}8.13 & -7.67 & -2.71\end{bmatrix}$, p2=$\begin{bmatrix}8.82 & -5.61 & -5.0\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-3.5 & -5.57 & 2.33\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.56 & -0.37 & -0.74\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

440. What are the A, B, and C components of the line passing through $\begin{bmatrix}-2.0 & 3.0 & -5.0\end{bmatrix}$ and $\begin{bmatrix}-5.0 & 4.0 & 0.0\end{bmatrix}$, where Ax + By + C = 0

441. Ray R has starting point e=$\begin{bmatrix}4.6 & 4.67 & -1.82\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.17 & -0.7 & -0.7\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}4.0 & 0.63 & -4.09\end{bmatrix}\begin{bmatrix}1.26 & 0.45 & -5.0\end{bmatrix}\begin{bmatrix}4.55 & 1.91 & -7.01\end{bmatrix}\begin{bmatrix}6.01 & 1.91 & -6.28\end{bmatrix}\begin{bmatrix}2.72 & 1.91$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

442. What are the origin and direction of a ray cast from the viewpoint to pixel (4, 3) in a 456 x 738 image with the following parameters? l=-3, r=-1, b=-1, t=0 view type = perspective camera origin = $\begin{bmatrix}-1.0 & -1.0 & 4.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.87 & -0.35 & -0.35\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.86 & 0.0 & 0.51\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.8 & -0.27 & -0.53\end{bmatrix}$

443. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 4) in a 386 x 568 image with the following parameters? l=2, r=3, b=-4, t=3 view type = orthographic camera origin = $\begin{bmatrix}-1.0 & -2.0 & -5.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.67 & -0.33 & -0.67\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.93 & 0.0 & 0.37\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.66 & -0.53 & 0.53\end{bmatrix}$

444. Triangle T has vertices p0=$\begin{bmatrix}6.22 & -6.33 & 2.94\end{bmatrix}$, p1=$\begin{bmatrix}4.0 & -3.0 & 2.66\end{bmatrix}$, p2=$\begin{bmatrix}5.11 & -4.66 & 0.17\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}5.83 & -5.74 & -1.65\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.32 & 0.49 & 0.81\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

445. Ray R has starting point e=$\begin{bmatrix}-0.34 & 4.6 & -2.02\end{bmatrix}$ and direction d=$\begin{bmatrix}0.67 & 0.33 & 0.67\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-2.12 & 5.97 & -1.62\end{bmatrix}\begin{bmatrix}2.25 & 2.69 & -1.62\end{bmatrix}\begin{bmatrix}2.87 & 4.72 & -4.12\end{bmatrix}\begin{bmatrix}-3.37 & 5.5 & -0.22\end{bmatrix}\begin{bmatrix}4.75$

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

446. Ray R has starting point e=$\begin{bmatrix}-2.29 & -5.16 & 1.0\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.0 & 1.0 & -0.0\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}4.49 & -1.97 & 1.97\end{bmatrix}\begin{bmatrix}4.97 & 0.7 & 0.51\end{bmatrix}\begin{bmatrix}5.94 & -1.97 & 2.94\end{bmatrix}\begin{bmatrix}4.73 & 0.46 & 0.51\end{bmatrix}\begin{bmatrix}7.88 & -0.76$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection 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. What are the A, B, and C components of the line passing through $\begin{bmatrix}-3.0 & -2.0 & -1.0\end{bmatrix}$ and $\begin{bmatrix}-1.0 & -2.0 & -4.0\end{bmatrix}$, where Ax + By + C = 0

448. Ray R has starting point e=$\begin{bmatrix}-3.3 & 3.45 & 1.4\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.41 & -0.82 & -0.41\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-0.4 & -3.6 & 2.2\end{bmatrix}\begin{bmatrix}4.4 & 4.0 & 5.8\end{bmatrix}\begin{bmatrix}1.2 & 1.8 & 3.4\end{bmatrix}\begin{bmatrix}2.0 & 0.2 & 4.0\end{bmatrix}\begin{bmatrix}1.2 & 1.8 & 3.4\end{bmatrix}$.
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?

449. What are the A, B, and C components of the line passing through $\begin{bmatrix}-1.0 & 2.0 & 4.0\end{bmatrix}$ and $\begin{bmatrix}0.0 & 4.0 & -3.0\end{bmatrix}$, where Ax + By + C = 0

450. What are the barycentric coordinates of point P=$\begin{bmatrix}-1.88 & -1.83 & -0.44\end{bmatrix}$ with respect to triangle T with vertices -2.00 -3.00 2.00 -1.00 1.00 -4.00 -3.00 -3.00 -2.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}5.0 & 1.0 & 2.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 0.3 & 0.7\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}0.0 & 1.0 & 1.5\end{bmatrix}$, what is P's color?

451. What are the origin and direction of a ray cast from the viewpoint to pixel (1, 2) in a 724 x 360 image with the following parameters? l=-5, r=3, b=-5, t=-2 view type = perspective camera origin = $\begin{bmatrix}3.0 & -3.0 & -2.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.15 & -0.77 & -0.62\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.0 & -1.0 & 0.0\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.42 & 0.57 & -0.71\end{bmatrix}$

452. What are the A, B, and C components of the line passing through $\begin{bmatrix}-2.0 & 2.0 & -1.0\end{bmatrix}$ and $\begin{bmatrix}3.0 & -5.0 & 3.0\end{bmatrix}$, where Ax + By + C = 0

453. What are the A, B, and C components of the line passing through $\begin{bmatrix}-3.0 & 0.0 & -2.0\end{bmatrix}$ and $\begin{bmatrix}-4.0 & 4.0 & -1.0\end{bmatrix}$, where Ax + By + C = 0

454. What are the A, B, and C components of the line passing through $\begin{bmatrix}3.0 & 2.0 & -1.0\end{bmatrix}$ and $\begin{bmatrix}4.0 & -3.0 & -4.0\end{bmatrix}$, where Ax + By + C = 0

455. What are the A, B, and C components of the line passing through $\begin{bmatrix}4.0 & -3.0 & -3.0\end{bmatrix}$ and $\begin{bmatrix}-3.0 & -1.0 & -3.0\end{bmatrix}$, where Ax + By + C = 0

456. Ray R has starting point e=$\begin{bmatrix}-4.52 & -2.68 & -1.09\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.19 & -0.19 & 0.96\end{bmatrix}$.
Polygon P has vertices $\begin{bmatrix}-1.33 & -8.54 & 1.07\end{bmatrix}\begin{bmatrix}-4.8 & -0.79 & -4.01\end{bmatrix}\begin{bmatrix}-6.41 & -0.53 & 0.27\end{bmatrix}\begin{bmatrix}-5.07 & -3.73 & 2.$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

457. Triangle T has vertices p0=$\begin{bmatrix}-6.11 & 4.0 & -3.79\end{bmatrix}$, p1=$\begin{bmatrix}-5.37 & 8.64 & -1.93\end{bmatrix}$, p2=$\begin{bmatrix}-3.89 & 7.34 & 1.79\end{bmatrix}$.
Ray R has starting point e=$\begin{bmatrix}-15.92 & 3.87 & 1.0\end{bmatrix}$ and direction d=$\begin{bmatrix}0.2 & 0.98 & -0.0\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

458. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 2) in a 731 x 494 image with the following parameters? l=-5, r=4, b=-4, t=1 view type = perspective camera origin = $\begin{bmatrix}4.0 & 2.0 & 2.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.0 & 0.62 & -0.78\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.56 & 0.74 & -0.37\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.95 & -0.32 & 0.0\end{bmatrix}$

459. What are the barycentric coordinates of point P=$\begin{bmatrix}1.06 & -1.34 & -1.83\end{bmatrix}$ with respect to triangle T with vertices 2.00 -3.00 -4.00 1.00 1.00 2.00 -3.00 0.00 -2.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.0 & 2.0 & 4.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 5.0 & 2.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}0.5 & 1.0 & 1.2\end{bmatrix}$, what is P's color?

460. Ray R has starting point e=$\begin{bmatrix}-13.48 & -0.57 & 2.39\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.64 & -0.64 & -0.43\end{bmatrix}$.
Polygon P has vertices $\begin{bmatrix}-7.18 & -1.21 & -4.48\end{bmatrix}\begin{bmatrix}-5.79 & 0.87 & -2.57\end{bmatrix}\begin{bmatrix}-1.61 & 2.27 & 1.96\end{bmatrix}\begin{bmatrix}-3.0 & -8.87 & -2.$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection 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 A, B, and C components of the line passing through $\begin{bmatrix}-4.0 & 1.0 & 4.0\end{bmatrix}$ and $\begin{bmatrix}1.0 & 0.0 & 0.0\end{bmatrix}$, where Ax + By + C = 0

462. What are the barycentric coordinates of point P=$\begin{bmatrix}-4.61 & -1.84 & 1.0\end{bmatrix}$ with respect to triangle T with vertices -2.00 -2.00 -1.00 -2.00 -5.00 0.00 4.00 -1.00 -3.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}2.0 & 2.0 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}2.0 & 1.0 & 5.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}5.0 & 1.0 & 1.0\end{bmatrix}$, what is P's color?

463. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 2) in a 582 x 349 image with the following parameters? l=-4, r=-3, b=3, t=4 view type = orthographic camera origin = $\begin{bmatrix}3.0 & -4.0 & -1.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.39 & -0.65 & -0.65\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.43 & 0.64 & -0.64\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.37 & 0.74 & -0.56\end{bmatrix}$

464. Triangle T has vertices p0=$\begin{bmatrix}4.28 & 1.0 & 1.85\end{bmatrix}$, p1=$\begin{bmatrix}2.36 & 4.2 & -2.62\end{bmatrix}$, p2=$\begin{bmatrix}4.92 & 2.71 & 0.57\end{bmatrix}$.
Ray R has starting point e=$\begin{bmatrix}0.98 & 2.14 & 0.46\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.67 & -0.33 & 0.67\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of

the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

465. What are the barycentric coordinates of point P=$\begin{bmatrix}-9.38 & -0.97 & 1.0\end{bmatrix}$ with respect to triangle T with vertices -5.00 1.00 -2.00 1.00 1.00 -4.00 -1.00 -1.00 0.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.0 & 3.0 & 0.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.7 & 1.0 & 0.3\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.0 & 0.8 & 1.2\end{bmatrix}$, what is P's color?

466. What are the A, B, and C components of the line passing through $\begin{bmatrix}3.0 & -5.0 & 3.0\end{bmatrix}$ and $\begin{bmatrix}-4.0 & 4.0 & 3.0\end{bmatrix}$, where Ax + By + C = 0

467. What are the A, B, and C components of the line passing through $\begin{bmatrix}-1.0 & -2.0 & -4.0\end{bmatrix}$ and $\begin{bmatrix}2.0 & 0.0 & 0.0\end{bmatrix}$, where Ax + By + C = 0

468. Ray R has starting point e=$\begin{bmatrix}-1.93 & -7.5 & 3.28\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.22 & -0.87 & -0.44\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-1.76 & -8.88 & 3.97\end{bmatrix}\begin{bmatrix}-3.21 & 0.82 & -1.85\end{bmatrix}\begin{bmatrix}-2.24 & -4.51 & 2.03\end{bmatrix}\begin{bmatrix}-2.24 & -1.12 & 2.0$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

469. Triangle T has vertices p0=$\begin{bmatrix}-3.12 & -2.88 & 1.71\end{bmatrix}$, p1=$\begin{bmatrix}-2.41 & -3.59 & -0.41\end{bmatrix}$, p2=$\begin{bmatrix}-2.41 & -3.59 & 1.0\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-3.18 & -1.44 & 1.02\end{bmatrix}$ and direction d=$\begin{bmatrix}0.3 & -0.9 & -0.3\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

470. What are the A, B, and C components of the line passing through $\begin{bmatrix}4.0 & -2.0 & -3.0\end{bmatrix}$ and $\begin{bmatrix}-3.0 & 0.0 & 1.0\end{bmatrix}$, where Ax + By + C = 0

471. Triangle T has vertices p0=$\begin{bmatrix}3.03 & -5.91 & -0.46\end{bmatrix}$, p1=$\begin{bmatrix}4.97 & -1.79 & 0.76\end{bmatrix}$, p2=$\begin{bmatrix}7.88 & 1.85 & 0.03\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}4.79 & -2.64 & 0.29\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.0 & 0.45 & -0.89\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

472. What are the A, B, and C components of the line passing through $\begin{bmatrix}3.0 & -5.0 & 2.0\end{bmatrix}$ and $\begin{bmatrix}-5.0 & -4.0 & -1.0\end{bmatrix}$, where Ax + By + C = 0

473. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 0) in a 593 x 584 image with the following parameters? l=-4, r=2, b=-4, t=-2 view type = orthographic camera origin = $\begin{bmatrix}-4.0 & -3.0 & -1.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.67 & -0.33 & -0.67\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.43 & -0.64 & -0.64\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.44 & 0.87 & 0.22\end{bmatrix}$

474. What are the A, B, and C components of the line passing through $\begin{bmatrix}4.0 & 0.0 & -5.0\end{bmatrix}$ and $\begin{bmatrix}-3.0 & 2.0 & -3.0\end{bmatrix}$, where Ax + By + C = 0

475. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 1) in a 398 x 402 image with the following parameters? l=2, r=4, b=-4, t=0 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 = $\begin{bmatrix}-0.82 & 0.41 & -0.41\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.27 & -0.8 & 0.53\end{bmatrix}$

476. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 4) in a 538 x 585 image with the following parameters? l=-4, r=0, b=-5, t=-2 view type = perspective camera origin = $\begin{bmatrix}1.0 & -1.0 & -4.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.22 & -0.44 & -0.87\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.62 & 0.15 & -0.77\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.53 & -0.66 & 0.53\end{bmatrix}$

477. Triangle T has vertices p0=$\begin{bmatrix}0.64 & -0.4 & -4.92\end{bmatrix}$, p1=$\begin{bmatrix}-0.2 & 2.4 & -3.52\end{bmatrix}$, p2=$\begin{bmatrix}-1.18 & 3.1 & -2.4\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-10.67 & 1.56 & 1.0\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.37 & 0.93 & -0.0\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

478. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 3) in a 427 x 287 image with the following parameters? l=-4, r=0, b=-4, t=-1 view type = perspective camera origin = $\begin{bmatrix}1.0 & -4.0 & 3.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.87 & 0.22 & -0.44\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.3 & -0.75 & 0.6\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.27 & -0.53 & -0.8\end{bmatrix}$

479. Triangle T has vertices p0=$\begin{bmatrix}8.9 & 0.63 & -1.63\end{bmatrix}$, p1=$\begin{bmatrix}3.59 & -2.22 & -0.41\end{bmatrix}$, p2=$\begin{bmatrix}4.41 & 1.04 & 0.82\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}5.06 & -1.64 & -1.08\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.15 & 0.77 & 0.62\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

480. Triangle T has vertices p0=$\begin{bmatrix}-4.04 & -3.83 & -6.68\end{bmatrix}$, p1=$\begin{bmatrix}-0.61 & -4.43 & -5.79\end{bmatrix}$, p2=$\begin{bmatrix}-5.68 & 0.34 & -4.0\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-18.06 & -1.67 & -1.91\end{bmatrix}$ and direction d=$\begin{bmatrix}0.71 & -0.0 & 0.71\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

481. What are the origin and direction of a ray cast from the viewpoint to pixel (3, 1) in a 692 x 687 image with the following parameters? l=-5, r=-4, b=-5, t=-4 view type = perspective camera origin = $\begin{bmatrix}2.0 & 4.0 & 0.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.3 & -0.6 & -0.75\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.57 & -0.71 & 0.42\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.91 & -0.18 & -0.37\end{bmatrix}$

482. Ray R has starting point e=$\begin{bmatrix}-11.14 & -0.35 & 1.0\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.24 & 0.97 & -0.0\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-6.68 & 4.89 & -5.79\end{bmatrix}\begin{bmatrix}-5.34 & 6.24 & -8.47\end{bmatrix}\begin{bmatrix}-2.21 & 4.0 & -4.0\end{bmatrix}\begin{bmatrix}-3.55 & 2.21 & -0.42\end{bmatrix}$
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?

483. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 0) in a 417 x 471 image with the following parameters? l=-5, r=4, b=-1, t=3 view type = orthographic

camera origin = $\begin{bmatrix}-3.0 & -2.0 & 4.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.2 & -0.78 & -0.59\end{bmatrix}$ camera v axis = $\begin{bmatrix}-0.75 & 0.3 & -0.6\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.23 & 0.69 & -0.69\end{bmatrix}$

484. What are the A, B, and C components of the line passing through $\begin{bmatrix}4.0 & -3.0 & -2.0\end{bmatrix}$ and $\begin{bmatrix}2.0 & 2.0 & -1.0\end{bmatrix}$, where Ax + By + C = 0

485. Ray R has starting point e=$\begin{bmatrix}3.34 & 0.5 & 3.49\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.44 & 0.22 & -0.87\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}3.61 & 3.39 & 2.96\end{bmatrix}\begin{bmatrix}3.09 & 2.0 & 2.09\end{bmatrix}\begin{bmatrix}-1.96 & -2.18 & -4.0\end{bmatrix}\begin{bmatrix}3.61 & 3.39 & 2.96\end{bmatrix}\begin{bmatrix}0.13 & 0.61$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection 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=$\begin{bmatrix}-4.1 & -0.6 & -4.25\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.0 & -0.83 & 0.55\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-6.22 & 0.55 & -2.17\end{bmatrix}\begin{bmatrix}-4.55 & -0.55 & -3.83\end{bmatrix}\begin{bmatrix}-0.95 & -2.22 & -6.33\end{bmatrix}\begin{bmatrix}-4.83 & -2.22$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection 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. What are the barycentric coordinates of point P=$\begin{bmatrix}-1.85 & 0.23 & -2.22\end{bmatrix}$ with respect to triangle T with vertices -4.00 1.00 0.00 -2.00 1.00 -3.00 -1.00 -4.00 2.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.0 & 1.3 & 1.7\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}1.0 & 1.0 & 0.3\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}0.8 & 0.5 & 1.0\end{bmatrix}$, what is P's color?

488. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 3) in a 629 x 504 image with the following parameters? l=-3, r=3, b=2, t=3 view type = orthographic camera origin = $\begin{bmatrix}-4.0 & 4.0 & -2.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.58 & 0.58 & 0.58\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.51 & -0.17 & -0.85\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.49 & -0.81 & -0.32\end{bmatrix}$

489. What are the origin and direction of a ray cast from the viewpoint to pixel (0, 2) in a 651 x 748 image with the following parameters? l=-2, r=-1, b=-5, t=1 view type = orthographic camera origin = $\begin{bmatrix}-3.0 & -5.0 & -5.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}-0.87 & 0.35 & 0.35\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.49 & -0.73 & -0.49\end{bmatrix}$ camera w axis = $\begin{bmatrix}-0.85 & -0.51 & -0.17\end{bmatrix}$

490. Triangle T has vertices p0=$\begin{bmatrix}-1.59 & -1.76 & -2.36\end{bmatrix}$, p1=$\begin{bmatrix}-0.41 & -2.71 & 0.24\end{bmatrix}$, p2=$\begin{bmatrix}-5.83 & -2.24 & 3.77\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-13.18 & -2.94 & -0.2\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.0 & 0.45 & 0.89\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

491. What are the A, B, and C components of the line passing through $\begin{bmatrix}0.0 & 3.0 & 1.0\end{bmatrix}$ and $\begin{bmatrix}-3.0 & 2.0 & -3.0\end{bmatrix}$, where Ax + By + C = 0

492. Triangle T has vertices p0=$\begin{bmatrix}4.5 & -2.83 & 4.66\end{bmatrix}$, p1=$\begin{bmatrix}2.0 & -0.34 & 3.0\end{bmatrix}$, p2=$\begin{bmatrix}-1.33 & -2.55 & 0.78\end{bmatrix}$. Ray R has starting point e=$\begin{bmatrix}-5.38 & -4.12 & 1.0\end{bmatrix}$ and direction d=$\begin{bmatrix}0.78 & 0.62 & -0.0\end{bmatrix}$.
b) What are the beta and gamma barycentric coordinates and the t distance along the ray of

the intersection between R and the plane defined by T?
c) Is the intersection point inside the triangle?
d) Is the intersection point in front of the viewpoint e?

493. Ray R has starting point e=$\begin{bmatrix}-0.3 & 2.3 & 1.86\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.3 & -0.9 & -0.3\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}1.61 & 0.08 & -6.62\end{bmatrix}\begin{bmatrix}-0.55 & 3.17 & -5.08\end{bmatrix}\begin{bmatrix}1.15 & 1.01 & -5.23\end{bmatrix}\begin{bmatrix}6.09 & -4.7 & -3.38\end{bmatrix}\begin{bmatrix}0.99 & 2.39$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

494. What are the A, B, and C components of the line passing through $\begin{bmatrix}0.0 & -2.0 & 3.0\end{bmatrix}$ and $\begin{bmatrix}-1.0 & -1.0 & -2.0\end{bmatrix}$, where Ax + By + C = 0

495. Ray R has starting point e=$\begin{bmatrix}-7.54 & 3.25 & -5.71\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.0 & -0.71 & 0.71\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-3.27 & 0.89 & -7.62\end{bmatrix}\begin{bmatrix}-9.62 & 1.46 & -1.85\end{bmatrix}\begin{bmatrix}-5.0 & -0.27 & -4.73\end{bmatrix}\begin{bmatrix}-3.85 & 0.31 & -6.$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection 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. Ray R has starting point e=$\begin{bmatrix}-4.08 & -3.82 & -4.57\end{bmatrix}$ and direction d=$\begin{bmatrix}-0.18 & 0.91 & 0.37\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-0.46 & -3.54 & 0.71\end{bmatrix}\begin{bmatrix}-1.88 & -2.12 & -3.54\end{bmatrix}\begin{bmatrix}-5.41 & 1.41 & -2.83\end{bmatrix}\begin{bmatrix}-1.88 & -2.12 & 1$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

497. Ray R has starting point e=$\begin{bmatrix}-3.25 & -2.62 & 0.39\end{bmatrix}$ and direction d=$\begin{bmatrix}0.75 & -0.3 & -0.6\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}-0.62 & -3.46 & -1.62\end{bmatrix}\begin{bmatrix}-1.58 & -6.35 & -2.38\end{bmatrix}\begin{bmatrix}-1.19 & -4.81 & -2.0\end{bmatrix}\begin{bmatrix}2.08 & -4.23 & -1.2$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?

498. What are the origin and direction of a ray cast from the viewpoint to pixel (2, 0) in a 502 x 558 image with the following parameters? l=-5, r=-4, b=-4, t=2 view type = orthographic camera origin = $\begin{bmatrix}-2.0 & 0.0 & 2.0\end{bmatrix}$ camera u axis = $\begin{bmatrix}0.6 & 0.3 & -0.75\end{bmatrix}$ camera v axis = $\begin{bmatrix}0.67 & -0.67 & -0.33\end{bmatrix}$ camera w axis = $\begin{bmatrix}0.44 & 0.22 & -0.87\end{bmatrix}$

499. What are the barycentric coordinates of point P=$\begin{bmatrix}2.02 & 3.99 & -1.53\end{bmatrix}$ with respect to triangle T with vertices -1.00 3.00 -2.00 3.00 4.00 -2.00 -3.00 4.00 1.00?
b) Is point P inside or outside T?
c) If vertex 0 has color $\begin{bmatrix}1.0 & 1.0 & 1.0\end{bmatrix}$, and vertex 1 has color $\begin{bmatrix}0.3 & 1.0 & 0.0\end{bmatrix}$, and vertex 2 has color $\begin{bmatrix}1.0 & 1.2 & 0.0\end{bmatrix}$, what is P's color?

500. Ray R has starting point e=$\begin{bmatrix}-5.03 & 0.12 & 0.23\end{bmatrix}$ and direction d=$\begin{bmatrix}0.17 & -0.7 & 0.7\end{bmatrix}$. Polygon P has vertices $\begin{bmatrix}3.95 & 0.85 & -1.74\end{bmatrix}\begin{bmatrix}2.05 & -4.85 & -1.11\end{bmatrix}\begin{bmatrix}2.05 & -4.85 & 4.9\end{bmatrix}\begin{bmatrix}3.32 & -1.05 & 5.53\end{bmatrix}\begin{bmatrix}3.95 & 0.85$
b) What is the normal to P?
c) What is the t intersection point of R and P?
d) What is the (x, y, z) intersection point on R at t?
e) Is the intersection point inside the polygon?
f) Is the intersection point in front of the viewpoint e?