First Name:_____ Last Name: _____ Student ID: _____

Equations of Lines and Planes

1. Determine which of the following points lie on the line ℓ: (x,y,z)=(2,−3,4)+t(1,3,2).

a. (3,0,6) b. (−1,−12,−2) c. (8,−8,12)

2. Given the line ℓ: (x,y,z)=(8,2,−3)+t(4,1,−2)

a. Find the point on the line with an x-coordinate of 120.
b. Does the line have an x-intercept, a y-intercept, or a z-intercept? If so, find them.

3. For each of the following, find the vector equation of the line that:

a. is parallel to (6,4,1) and passes through the point (3,0,−4)
b. passes through the points (2,−4,3) and (−4,−8,7)
c. is parallel to the y-axis and passes through the point (6,−2,−4)
d. has x-intercept 5 and z-intercept −10

4. If the points (4,2,7), (6,19,−4), and (80,*b*,*c*) lie on the same straight line, find the values of *b* and *c*.

5. Determine the angle between each pair of lines:

a. l_1: (x,y,z)=(4,5,−2)+*t*(3,−1,−1) and l_2: (x,y,z)=(4,5,−2)+*s*(−2,−3,2)

b. $l_1: \begin{cases} x = 20 + 3t \\ y = -10 + 2t \\ z = 4 \end{cases}$ and $l_2: \begin{cases} x = 20 + t \\ y = -10 + 5t \\ z = 4 \end{cases}$

6. Find, in parametric form, the equation of a line perpendicular to both

l_1: (x,y,z)=(3,7,−2)+*t*(3,−1,−1) and l_2: (x, y, z)=(8,−3,−3)+*t*(−2,−3,2) that passes through (5,0,0).

7. Which of the following points are on the plane 3*x*−*y*+2*z*−12=0?

a. (3,9,6)

b. (0,2,7)

c. (4,−2,−1)

d. (6,3,−5)

8. Find a vector perpendicular to the plane:

a. $5x+3y-2z+16=0$
b. $2x-z-18=0$
c. $\vec{r}=(1,0,2)+s(6,1,-2)+t(2,-1,3)$

9. Find a scalar equation for each of the following planes:

a. The plane with normal vector $(5,1,-1)$ and passing through $(3,0,2)$
b. The plane with vector equation $\vec{r}=(1,0,2)+s(1,1,1)+t(2,-1,3)$
c. $\begin{cases} x = 3 + 4s - t \\ y = s + 3t \\ z = -2 - s + 4t \end{cases}$
d. The plane that passes through the points $(5,-2,3)$,$(-3,1,2)$, and $(6,0,4)$.
e. The plane with a x-intercept of 12, a y-intercept of 3, and a z-intercept of -2.

10. Determine the values of k so that the points $(1,3,1),(2,4,5),(-4,1,8)$, and $(6,1,k)$ are coplanar.

11. Find the angle between the pair of planes.

$6x+y-2z+24=0$

$2x-5y+3z-1=0$