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

Relationships Between Points, Lines and Planes (2)

1. For the following, find the distance between the given point *P* and the line ℓ.

a. *P* (1,2); ℓ: 3*x*+*y*−12=0
b. *P* (5,−3); ℓ: (x, y)= (−8,2)+*t*(2,1)

2. Find the distance between each of the following pairs of parallel lines.

a. ℓ1: $\vec{r}$= (5,2,3)+*s*(3,1,−1) and ℓ2: $\vec{r}$= (−4,2,4)+*t*(3,1,−1)
b. ℓ1: $\vec{r}$= (0,2,3)+*s*(3,3,1) and ℓ2: $\vec{r}$= (4,−1,1)+*t*(3,3,1)

3. a. Find the point on the line ℓ: $\begin{cases} x = 2 + 3s \\ y = 1 - s \\ z = -4 + s \end{cases}$ that is closest to the point (5, −2, 8).

b. Determine the distance between (5, −2, 8) and ℓ.

4. The point *A* (−5, 2, 4) is reflected in the line with equation $\frac{x}{4} = \frac{y}{2} = z-1$. Find the coordinates of its image, *A*'.

5. Find the distance between the following pairs of skew lines.

ℓ1: (x, y, z) = (4, 1, 0) + *s*(1, 3, 2) and ℓ2 : (x, y, z) = (−5, 3, 3) + *t*(−1, 1, 2)

6. Find the distance between the line and the plane:

$x - 4 = y - 5 = z + 1$ and $x - 3y + 2z - 24 = 0$

7. Find the point on the plane $x - 2y + z - 8 = 0$ that is closest to (10, 12, 4) (Hint: it is on a line that passes through the given point, perpendicular to the plane.)

8. Find the distance between the two planes:

$x - 2y + 3z + 6 = 0$ and $x - 2y + 3z - 24 = 0$