Practice Assignment 2A

1. Show that the points (3, 4, 5), (0, −1, 2), (6, 9, 8) are collinear.

2. Find the direction cosines of the sides of the triangle whose vertices are B (−2, −3, 1), C (−4, −4, −1) and D (2, 3, −2).

3. Find the Cartesian equation of the line which passes through the point (−1, 3, −6) and is parallel to the line given by $\frac{x+2}{4}=\frac{y-3}{3}=\frac{z+7}{5}$.

4. The Cartesian equation of a line is $\frac{x-3}{5}=\frac{y+2}{4}=\frac{z-4}{6}$. Write its vector form.

5. Find the angle between the following pair of lines:

$$\frac{x-1}{3}=\frac{y-2}{4}=\frac{z+5}{-1} \text{ and } \frac{x+3}{-2}=\frac{y-2}{7}=\frac{z-4}{5}$$

6. Find the values of p so the line $\frac{2-x}{4}=\frac{8y-15}{3p}=\frac{2z-4}{3}$ and $\frac{8-8x}{4p}=\frac{2y-4}{2}=\frac{7-2z}{6}$ are at right angles.

7. Find the shortest distance between the lines

$$\vec{r}=\left(2\hat{i}+\hat{j}+\hat{k}\right)+\lambda\left(\hat{i}+\hat{j}-\hat{k}\right) \text{ and } \vec{r}=\hat{i}-2\hat{j}-\hat{k}+\mu\left(\hat{i}+2\hat{j}+\hat{k}\right)$$

8. In each of the following cases, determine the direction cosines of the normal to the plane and the distance from the origin.

   (a) $z = 4$

   (b) $2x + 2y + 2z = 5$.

9. Find the vector equation of the plane passing through the intersection of the planes $\vec{r}\cdot\left(3\hat{i}+\hat{j}-2\hat{k}\right)=8, \vec{r}\cdot\left(4\hat{i}+3\hat{j}+2\hat{k}\right)=5$ and the point (3, 2, 4).

10. In the following cases, determine whether the given planes are parallel or perpendicular, and in case they are neither, find the angles between them.

   (a) $6x + 4y + 5z + 29 = 0$ and $2x - 5y - 8z + 3 = 0$

   (b) $3x + 2y + z - 1 = 0$ and $2x - 3y + 3 = 0$.