9.5 Equations of Lines and Planes

Equations of lines

Example 1
Find a vector equation for the line that passes through the point $(2, -1, 5)$ parallel to the vector $\vec{i} - 2\vec{j} + \vec{k}$, and find two other points on the line.

Symmetric equation form of a line

Example 2

Find parametric equations and symmetric equations of the line that passes through the points $(-1,5,2)$ and $(2,-1,5)$. At what point does this line intersect the *yz*-plane.

General form of the line segment connecting $\boldsymbol{r_0}$ and $\boldsymbol{r_1}$.

Example 3

Show that the lines L_1 and L_2 with parametric equations

$$x = 2 - t \quad y = 3 + 2t \quad z = 2t - 1$$
$$x = 5 + s \quad y = 3s + 1 \quad z = 2s - 5$$

are skew lines.

Equation of a plane

Example 4
Find the equation of the plane that goes through the point $(3, -5, 2)$ with normal vector $\vec{n} = \langle 2,1,3 \rangle$. Find the intercepts and sketch the plane.

Example 5
Find the equation of the plane that passes through the points (0,1,1), (1,0,1), and (1,1,0).

Example 6
Find the angle between the planes $x + 2y - z = 1$ and $3x - y + z = 3$ and find the symmetric equations of the line of intersection.

Find the formula for the shortest distance D from a point $P_1(x_1, y_2, z_1)$ to the plane $ax + by + cz + d = 0$.

Example 7

Find the distance between the parallel planes $x + 2y - z = 5$ and $2x + 4y - 2z = 7$.

Example 8

In a previous example we showed that the lines L_1 and L_2 with parametric equations

$$x = 2 - t \quad y = 3 + 2t \quad z = 2t - 1$$
$$x = 5 + s \quad y = 3s + 1 \quad z = 2s - 5$$

are skew lines.

Find the distance between these lines.

HW 9.5 # 1, 3, 5, 7, 13, 17, 19, 21, 23, 27, 31, 33, 35, 43, 47, 53