Section 11.6 Planes in 3-Space

A plane in space is determined by a point $P(x_0, y_0, z_0)$ in the plane and a vector $\mathbf{n}$ that is orthogonal to the plane. This orthogonal vector $\mathbf{n}$ is called a normal vector. If we write $\mathbf{n} =< a, b, c >$, the scalar equation of the plane through $P(x_0, y_0, z_0)$ with normal vector $\mathbf{n} =< a, b, c >$ is

$$a(x - x_0) + b(y - y_0) + c(z - z_0) = 0.$$

Two planes are parallel if their normal vectors are parallel. Similarly, two planes are perpendicular if their normal vectors are perpendicular.

The distance D from a point $P(x_1, y_1, z_1)$ to the plane $ax + by + cz + d = 0$ is given by

$$D = \frac{|ax_1 + by_1 + cz_1 + d|}{\sqrt{a^2 + b^2 + c^2}}.$$