Formulas & Definitions: Section 12-5

Definition:

- Parametric equations for a line through the point $(x_0, y_0 z_0)$ and parallel to the direction vector $\langle a, b, c\rangle$ are

$$\boxed{x=x_0 + at, \quad y = y_0 + bt, \quad z = z_0 + ct}$$

- Symmetric equations are:

$$\frac{x - x_0}{a} = \frac{y - y_0}{b} = \frac{z - z_0}{c}$$

Definition: The line segment from r_0 to r_1 is given by the vector equation

$$\boxed{r(t)=(1-t)r_0 + tr_1, \quad 0 \leq t \leq 1}$$

Definition: A vector equation of the plane is either

$$n \cdot (r - r_0) = 0, \quad or \quad n \cdot r = n \cdot r_0.$$

Definition: A scalar equation of the plane through point $P_0(x_0, y_0, z_0)$ with normal vector $n = \langle a, b, c\rangle$ is

$$\boxed{a(x-x_0) + b(y - y_0) + c(z - z_0) = 0}$$

Definition: A linear equation of the plane in x, y, and z is

$$\boxed{ax+by+cz+d=0}$$

Definition: The distance D from a point $P_1(x_1, y_1, z_1)$ to the plane $ax + by + cz + d = 0$ is

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