Tutorial 12

Week of December 3, 2018

1. Find parametric and symmetric equations of the following lines.
   (a) The line that passes through the points $P_1(-8, 1, 4)$ and $P_2(3, -2, 4)$.
   (b) The line that passes through $P(2, 1, 0)$ and is perpendicular to both $\mathbf{v} = \mathbf{i} + \mathbf{j}$ and $\mathbf{w} = \mathbf{j} + \mathbf{k}$.
   (c) The line that passes through $P(1, 0, 6)$ and is perpendicular to the plane $x + 3y + z = 5$.

2. Find the scalar equation of the following planes.
   (a) The plane that contains the point $(3, -2, 8)$ and is parallel to the plane $z = x + y$.
   (b) The plane that contains the line $x = 1 + t$, $y = 2 - t$, $z = 4 - 3t$ and is parallel to the plane $5x + 2y + z = 1$.

3. Determine whether the following statements are true or false.
   (a) $\mathbf{a} \times \mathbf{a} = \mathbf{0}$ for any vector $\mathbf{a} \in \mathbb{R}^3$.
   (b) The line through $P(-2, 4, 0)$ and $Q(1, 1, 1)$ is perpendicular to the line through $R(2, 3, 4)$ and $S(3, -1, -8)$.
   (c) The vector $\mathbf{a} = \langle 3, -1, 2 \rangle$ is parallel to the plane $6x - 2y + 4z = 1$.