

Last Name: SOLUTIONS

First Name: \_\_\_\_\_

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## Quiz 9 (B)

**Question 1.** (5 marks) Find the equation of the plane that passes through the points  $P_1(2, 0, -1)$ ,  $P_2(2, 3, 5)$ , and  $P_3(4, 4, 2)$ .

$$\vec{P_1P_2} = (2-2, 3-0, 5-(-1)) = (0, 3, 6)$$

$$\vec{P_1P_3} = (4-2, 4-0, 2-(-1)) = (2, 4, 3)$$

$$\vec{n} = \vec{P_1P_2} \times \vec{P_1P_3} = (0, 3, 6) \times (2, 4, 3) = \left( \begin{vmatrix} 3 & 4 \\ 6 & 3 \end{vmatrix}, -\begin{vmatrix} 0 & 2 \\ 6 & 3 \end{vmatrix}, \begin{vmatrix} 0 & 2 \\ 3 & 4 \end{vmatrix} \right)$$

$$= (-15, 12, -6)$$

$$\text{EQUATION: } -15x + 12y - 6z + d = 0$$

$$-15(2) + 12(0) - 6(-1) + d = 0$$

$$-24 + d = 0$$

$$d = 24$$

$$\therefore -15x + 12y - 6z + 24 = 0$$

**Question 2.** (2 marks) Find the equations of the line that passes through the point  $P(4, -2, 0)$  and is parallel to the vector  $\vec{v} = \left(\frac{25}{2}, -10, 5\right)$ .

$$\therefore (x, y, z) = \left(4 + \frac{25}{2}t, -2 - 10t, 5t\right) \quad t \in \mathbb{R}$$

**Question 3.** (3 marks) Are the plane found in question 1 and the line found in question 2 perpendicular, parallel or neither?

$$\vec{n} \cdot \vec{v} = (-15, 12, -6) \cdot \left(\frac{25}{2}, -10, 5\right) = -\frac{375}{2} - 120 - 30 = -\frac{675}{2} \neq 0$$

NOT PARALLEL

$$(-15, 12, -6) = l \left(\frac{25}{2}, -10, 5\right) \Rightarrow -15 = l \left(\frac{25}{2}\right) \Rightarrow l = -\frac{6}{5}$$

$$12 = l(-10) \Rightarrow l = -\frac{6}{5}$$

$$-6 = l(5) \Rightarrow l = -\frac{6}{5}$$

\therefore THE PLANE AND THE LINE ARE PERPENDICULAR.