MATH 21-259 Quiz 3 02/03/11

Name: Solution key

Allowed time: 15 mins

1. (4 points) Show that the line of intersection of the planes

$$\mathcal{P}_1 : x + y - z = 0 \text{ and } \mathcal{P}_2 : x - y - 5z - 6 = 0$$

is parallel to the line $\mathcal{L} : \frac{x-6}{3} = \frac{-y-3}{2} = \frac{z-3}{2}$.

$\vec{N}_1 = \langle 1, 1, -1 \rangle$, $\vec{N}_2 = \langle 1, -1, -5 \rangle$

$$\vec{N}_1 \times \vec{N}_2 = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & 1 & -1 \\ 1 & -1 & -5 \end{vmatrix} = -6\hat{i} + 4\hat{j} - 2\hat{k}$$

Direction vector of the line: $\langle 3, -2, 2 \rangle$

parallel vectors.

2. (4 points) Find the distance from the point A(2, 8, 5) to the plane $\mathcal{P} : x - 2y - 2z = 1$.

$$\text{Distance} = \left| \frac{2 - 2(8) - 2(5) - 1}{\sqrt{1^2 + 2^2 + 2^2}} \right| = \frac{25}{3} \text{ units}$$

3. (2 points) Let $\mathbf{g}(t) = 2t\mathbf{i} + t^2\mathbf{j} + \frac{1}{3}t^3\mathbf{k}$. Then find the scalar unit tangent vector at the point (6, 9, 9).

$g'(t) = 2\hat{i} + 2t\hat{j} + t^2\hat{k}$ Note $t = 3$

$$\text{unit tangent vector at } \underset{t=3}{(6,9,9)} = \frac{2}{11}\hat{i} + \frac{6}{11}\hat{j} + \frac{9}{11}\hat{k} \quad \text{Ans}$$