

Math 173 - Quiz 4

February 11, 2016

Name key

Score _____

Show all work to receive full credit. Supply explanations when necessary.

1. (3 points) Find a vector-valued function whose graph is the line segment connecting $(4, 3, 9)$ and $(1, 1, 7)$.

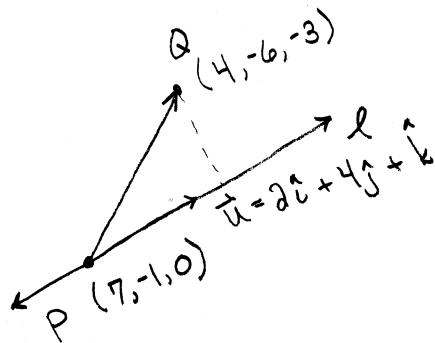
$$\begin{aligned}\vec{PQ} &= (1-4)\hat{i} + (1-3)\hat{j} + (7-9)\hat{k} \\ &= -3\hat{i} - 2\hat{j} - 2\hat{k}\end{aligned}$$

Using $(4, 3, 9)$:

$$x = 4 - 3t, \quad y = 3 - 2t, \quad z = 9 - 2t, \quad 0 \leq t \leq 1$$

$$\vec{r}(t) = (4-3t)\hat{i} + (3-2t)\hat{j} + (9-2t)\hat{k}, \quad 0 \leq t \leq 1$$

2. (3 points) The line ℓ has symmetric equations given below. Find the distance from ℓ to the point $(4, -6, -3)$.



$$\frac{x-7}{2} = \frac{y+1}{4} = z$$

$$D = \frac{\|\vec{PQ} \times \vec{u}\|}{\|\vec{u}\|} = \frac{\sqrt{(-7)^2 + (3)^2 + (2)^2}}{\sqrt{(2)^2 + (4)^2 + (1)^2}}$$

$$\vec{PQ} \times \vec{u} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 3 & 5 & 3 \\ 2 & 4 & 1 \end{vmatrix}$$

$$\begin{aligned}&= \hat{i}(-7) - \hat{j}(-3) + \hat{k}(2) \\ &= -7\hat{i} + 3\hat{j} + 2\hat{k}\end{aligned}$$

$$= \frac{\sqrt{62}}{\sqrt{21}} \approx 1.72$$

$$\vec{PQ} = 3\hat{i} + 5\hat{j} + 3\hat{k}$$

3. (4 points) Find an equation of the plane containing the points $(1, 1, 1)$, $(-1, 2, -3)$, and $(5, -1, 3)$. Then find the distance from that plane to the point $(2, 2, 2)$.

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$$\vec{AB} = -2\hat{i} + \hat{j} - 4\hat{k}$$

$$\vec{AC} = 4\hat{i} - 2\hat{j} + 2\hat{k}$$

$$\vec{n} = \vec{AB} \times \vec{AC} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ -2 & 1 & -4 \\ 4 & -2 & 2 \end{vmatrix}$$

$$\begin{aligned}&= \hat{i}(-6) - \hat{j}(12) + \hat{k}(0) \\ &= -6\hat{i} - 12\hat{j}\end{aligned}$$

Use $\vec{n} = \hat{i} + 2\hat{j}$ AND $A(1, 1, 1)$

Plane is $x + 2y = 1 + 2(1) = 3$

$$D = \frac{|1(2) + 2(2) - 3|}{\sqrt{1^2 + 2^2}} = \frac{3}{\sqrt{5}}$$