Math 173 - Quiz 3

February 5, 2015

Name **key**

Score _____

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

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1. (4 points) Give parametric equations for two distinct parallel lines. Then find the distance between your lines.

LINE 1: $x = t$, $y = 2 + 3t$, $z = 1 - t$

LINE 2: $x = 3 + t$, $y = 1 + 3t$, $z = 5 - t$

BOTH HAVE DIRECTION $\vec{u} = \hat{i} + 3\hat{j} - \hat{k}$.

LINE 1 PASSES THROUGH $(0, 2, 1)$ BUT LINE 2 DOES NOT.

DISTANCE...

$P(0, 2, 1)$ ← ON LINE 1

$Q(3, 1, 5)$ ← ON LINE 2

$\vec{u} = \hat{i} + 3\hat{j} - \hat{k}$ ← DIRECTION OF LINE

$\vec{PQ} = 3\hat{i} - \hat{j} + 4\hat{k}$

$$\vec{PQ} \times \vec{u} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 3 & -1 & 4 \\ 1 & 3 & -1 \end{vmatrix} = -11\hat{i} + 7\hat{j} + 10\hat{k}$$

$$\frac{\|\vec{PQ} \times \vec{u}\|}{\|\vec{u}\|} = \frac{\sqrt{270}}{\sqrt{11}} \approx \boxed{4.95}$$

2. (3 points) Find a set of parametric equations for a line perpendicular to the line described by the symmetric equations

$$\frac{x-6}{3} = y + 5 = \frac{z+2}{7}.$$

$\vec{u} = 3\hat{i} + \hat{j} + 7\hat{k}$

$P(6, -5, -2)$

LET $\vec{v} = 2\hat{i} + \hat{j} - \hat{k}$. $\vec{v}$ IS ORTHOG TO $\vec{u}$

PERP LINE IS $\quad \dfrac{x-6}{2} = \dfrac{y+5}{1} = \dfrac{z+2}{-1}$.

3. (3 points) Find an equation of the plane that is equidistant from the points $(3, 4, 5)$ and $(7, 2, 1)$.

$\overset{Q}{}$ $\overset{P}{}$

$\vec{PQ} = \vec{N} = 4\hat{i} - 2\hat{j} - 4\hat{k}$

POINT = MIDPOINT = $(5, 3, 3)$

THIS PLANE IS DIRECTLY BETWEEN THE POINTS.

$\Longrightarrow \quad 4(x-5) - 2(y-3) - 4(z-3) = 0$

OR

$$\boxed{4x - 2y - 4z = 2}$$