Math2210 Quiz 3 (Sections 11.4, 11.5, 11.6) Summer, 2012 Dylan Zwick

Name _____ Date _____

Instructions: Please show all of your work as partial credit will be given where appropriate, **and** there may be no credit given for problems where there is no work shown. All answers should be completely simplified, unless otherwise stated.

1. If $\boldsymbol{a}=\langle 3,3,2\rangle$, $\boldsymbol{b}=\langle -1,1,2\rangle$ and $\boldsymbol{c}=\langle -1,2,4\rangle$,

(a) find $\boldsymbol{a}\cdot(\boldsymbol{b}-\boldsymbol{c})$.

$$\vec{b}-\vec{c} = \langle -1,1,2\rangle - \langle -1,2,4\rangle$$
$$= \langle 0,-1,-2\rangle$$

$$\vec{a}\cdot(\vec{b}-\vec{c}) = \langle 3,3,2\rangle \cdot \langle 0,-1,-2\rangle = 0-3-4 = -7$$

$\boldsymbol{a}\cdot(\boldsymbol{b}-\boldsymbol{c})$ = $\boxed{-7}$

(b) find $|\boldsymbol{a}|(\boldsymbol{b}\times\boldsymbol{c})$

$$\vec{b}\times\vec{c} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ -1 & 1 & 2 \\ -1 & 2 & 4 \end{vmatrix} = 0\,\hat{i} + 2\,\hat{j} + (-1)\,\hat{k}$$

$$|\vec{a}| = \sqrt{3^2+3^2+2^2} = \sqrt{22}$$

$$|\vec{a}|(\vec{b}\times\vec{c}) = \langle 0, 2\sqrt{22}, -\sqrt{22}\rangle$$

$|\boldsymbol{a}|(\boldsymbol{b}\times\boldsymbol{c})$ = $2\sqrt{22}\,\hat{j} - \sqrt{22}\,\hat{k}$

2. Find parametric equations for the line of intersection of the planes
$5x-3y-2z = 5$ and $x + y + 2z = 3$.

$\vec{n}_1 = \langle 5, -3, -2 \rangle$

$\vec{n}_2 = \langle 1, 1, 2 \rangle$

$$\vec{n}_1 \times \vec{n}_2 = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 5 & -3 & -2 \\ 1 & 1 & 2 \end{vmatrix} = -4\hat{i} - 12\hat{j} + 8\hat{k}$$

$x = 0$ $\quad -3y - 2z = 5$

$y + 2z = 3$

~~$-4y$~~

$\Rightarrow -2y = 8 \Rightarrow y = -4$

$-4 + 2z = 3$

$2z = 7 \Rightarrow z = \frac{7}{2}$

Point $(0, -4, \frac{7}{2})$

Direction $\langle -4, -12, 8 \rangle$

Parametric Equations: $x(t) = -4t \quad y(t) = -4 - 12t \quad z(t) = \frac{7}{2} + 8t$

3. For the particle with position vector $\boldsymbol{r}(t) = (3t+4)\boldsymbol{i} + e^t\boldsymbol{j} + \sin(2t)\boldsymbol{k}$ calculate the velocity $\boldsymbol{v}(t)$ and the acceleration $\boldsymbol{a}(t)$.

$\vec{v}(t) = \vec{r}\,'(t) = 3\hat{i} + e^t\hat{j} + 2\cos(2t)\hat{k}$

$\vec{a}(t) = \vec{v}\,'(t) = \vec{r}\,''(t) = 0\hat{i} + e^t\hat{j} - 4\sin(2t)\hat{k}$

$\boldsymbol{v}(t) = 3\hat{i} + e^t\hat{j} + 2\cos(2t)\hat{k}$

$\boldsymbol{a}(t) = e^t\hat{j} - 4\sin(2t)\hat{k}$