Quiz 2 Name: Key

Directions: Answer each question to the best of your ability. You may use a calculator, but show all work to earn partial credit. The value of each question follows the question.

1. Let $\vec{u} = 2\vec{i} + 3\vec{j} + \vec{k}$, $\vec{v} = -\vec{i} + 2\vec{j} - 3\vec{k}$, and $\vec{w} = 2\vec{i} - \vec{j} - \vec{k}$. For each pair of vectors determine whether the angle between them is less than, equal to, or greater than 90 degrees by calculating the dot products. (3 pts each)

$\vec{u} * \vec{v}$

$(2 \cdot -1) + (3 \cdot 2) + (1 \cdot -3)$

1

$< 90^\circ$

$\vec{w} * \vec{v}$

$(2 \cdot -1) + (2 \cdot -1) + (-3 \cdot -1)$

-1

$> 90^\circ$

$\vec{u} * \vec{w}$

$(2 \cdot 2) + (-3 \cdot -1) + (-1 \cdot -1)$

0

90°

2. For which value(s) of λ makes the following 2 vectors perpendicular: $\vec{u} = \lambda\vec{i} + 3\vec{j} + \vec{k}$, and $\vec{v} = \lambda\vec{i} + 2\vec{j} - 7\lambda\vec{k}$ (4 pts)

By dot product: $\lambda^2 + 6 - 7\lambda = 0$

$(\lambda - 6)(\lambda - 1) = 0$

$\lambda = 6, 1$

3. Calculate the projection of $\vec{v}$ onto $\vec{u}$ if $\vec{u} = 2\vec{i} + 2\vec{j} + \vec{k}$, and $\vec{v} = -\vec{i} + 2\vec{j} - 3\vec{k}$. (4 pts)

$$\vec{V} = \frac{V \cdot u}{u \cdot u}(u) = \frac{-2+4-3}{4+4+1}(u)$$

$$= -\frac{1}{9}(u) = -\frac{2}{9}\vec{i} - \frac{2}{9}\vec{j} - \frac{1}{9}\vec{k}$$

4. Calculate $\vec{u} \times \vec{v}$. (4 pts)

$$\begin{vmatrix} i & j & k \\ 2 & 2 & 1 \\ -1 & 2 & -3 \end{vmatrix} = (-6-2)\vec{i} - (-6+1)\vec{j} + (4+2)\vec{k}$$

$$= -8\vec{i} + 5\vec{j} + 6\vec{k}$$

5. Calculate the equation of the plane containing the points (0,-2,2), (1,0,1), and (2,6,4) (4 pts)

$$V_1 = \langle 1, 2, -1 \rangle$$

$$V_2 = \langle 2, 8, 2 \rangle$$

$$\begin{vmatrix} i & j & k \\ 1 & 2 & -1 \\ 2 & 8 & 2 \end{vmatrix} = (4+8)\vec{i} - (2+2)\vec{j} + (8-4)\vec{k}$$

$$= 12\vec{i} - 4\vec{j} + 4\vec{k} \rightarrow 12x - 4y + 4z = 16$$

$$\downarrow \text{ OR}$$

$$3x - y + z = 4$$