

MATH 1930 Sec 092
HONORS CALCULUS II
QUIZ 6
April 12, 2013

Name (Last, First) Key

1. Find the angle between the following vectors.

$$\mathbf{u} = -\mathbf{i} + \mathbf{j}, \quad \mathbf{v} = \sqrt{2}\mathbf{i} + \sqrt{3}\mathbf{j} + 2\mathbf{k}$$

$$\mathbf{u} \cdot \mathbf{v} = \langle -1, 1, 0 \rangle \cdot \langle \sqrt{2}, \sqrt{3}, 2 \rangle = -\sqrt{2} + \sqrt{3}$$

$$|\mathbf{u}| = \sqrt{(-1)^2 + 1^2 + 0^2} = \sqrt{2}$$

$$|\mathbf{v}| = \sqrt{(\sqrt{2})^2 + (\sqrt{3})^2 + 2^2} = \sqrt{9} = 3$$

$$\therefore \cos \theta = \frac{\mathbf{u} \cdot \mathbf{v}}{|\mathbf{u}| |\mathbf{v}|} = \frac{\sqrt{3} - \sqrt{2}}{3\sqrt{2}} = 0.075$$

$$\therefore \theta = \cos^{-1}(0.075) = \boxed{85.7^\circ}$$

2. Find the $\mathbf{v} \times \mathbf{u}$ for the following vectors.

$$\mathbf{u} = -2\mathbf{i} + \mathbf{j} - 3\mathbf{k}, \quad \mathbf{v} = \mathbf{i} + -2\mathbf{j} + 4\mathbf{k}$$

$$\mathbf{v} \times \mathbf{u} = \begin{vmatrix} \mathbf{i} & \mathbf{j} & \mathbf{k} \\ 1 & -2 & 4 \\ -2 & 1 & -3 \end{vmatrix} = \mathbf{i}(6-4) - \mathbf{j}(-3+6) + \mathbf{k}(1-4)$$
$$= \boxed{2\mathbf{i} - 3\mathbf{j} - 3\mathbf{k}}$$