Assignment No. 2 **MATHEMATICS 2050** Fall 2004

Due as follows:

Dr. Kondratieva	Tuesday September 28	in class or assignment box
Dr. Goodaire	Wednesday September 29	9:50 a.m.
Dr. Yuan	Wednesday September 29	in class

[2] 1. Let $\mathbf{u}$ and $\mathbf{v}$ be vectors of lengths 3 and 5 respectively with $\mathbf{u} \cdot \mathbf{v} = 8$.
Find $(-3\mathbf{u} + 4\mathbf{v}) \cdot (2\mathbf{u} + 5\mathbf{v})$.

[2] 2. Let $\mathbf{v} = \begin{bmatrix} -1 \\ 2 \\ 2 \end{bmatrix}$. Find a vector of length 2 with the same direction as $\mathbf{v}$ and a vector of length 6 with direction opposite $\mathbf{v}$.

[2] 3. Find the angle between $\mathbf{u} = \begin{bmatrix} 1 \\ 3 \\ 2 \end{bmatrix}$ and $\mathbf{v} = \begin{bmatrix} -4 \\ -1 \\ 1 \end{bmatrix}$. Give your answer in radians to two decimal place accuracy, and in degrees to the nearest degree.

[2] 4. Let $\mathbf{u} = \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}$ and $\mathbf{v} = \begin{bmatrix} 2 \\ 1 \\ 0 \end{bmatrix}$. Find a real number k so that $\mathbf{u} + k\mathbf{v}$ is orthogonal to $\mathbf{u}$, if such k exists.

[3] 5. Let $A(1, 2)$, $B(-3, -1)$ and $C(4, -2)$ be three points in the Euclidean plane. Find a fourth point D such that the A, B, C, D are the vertices of a square **and justify your answer**.

[2] 6. Let $\mathbf{u} = \begin{bmatrix} u_1 \\ u_2 \\ u_3 \end{bmatrix}$ and $\mathbf{v} = \begin{bmatrix} v_1 \\ v_2 \\ v_3 \end{bmatrix}$. Show that $\mathbf{u} \times \mathbf{v}$ is orthogonal to $\mathbf{u}$.

[3] 7. Let $\mathbf{u} = \begin{bmatrix} 3 \\ 2 \\ 1 \end{bmatrix}$ and $\mathbf{v} = \begin{bmatrix} 4 \\ -1 \\ -1 \end{bmatrix}$. Find $a\mathbf{u} + b\mathbf{v}$. Then find the equation of the plane that consists of all such linear combinations of $\mathbf{u}$ and $\mathbf{v}$.

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