

Calculus III
Exam 1, Summer 2003

You may use graphing calculators and a Table of Integrals. Each problem is worth 20 points. You MUST show your work. Just the correct answer is not sufficient for any points.

1. $\mathbf{V} = 3\mathbf{I} - \mathbf{J}$, $\mathbf{W} = 2\mathbf{I} + 5\mathbf{J}$ are two vectors in the plane.
- Find the angle between \mathbf{V} and \mathbf{W} .
 - Find the vector which is orthogonal to \mathbf{V} and counterclockwise from \mathbf{W} .
 - Find the area of the parallelogram spanned by \mathbf{V} and \mathbf{W} .

2. A particle moves in the plane according to the equation

$$\mathbf{X}(t) = \ln t \mathbf{I} + \frac{1}{t} \mathbf{J}$$

Find the velocity, speed, acceleration, tangent and normal vectors, and normal acceleration of the particle at any time t .

3. Find the equation of the plane through the point $(0, -1, 3)$ which is parallel to the vectors $\mathbf{I} - 2\mathbf{J} + 2\mathbf{K}$ and $3\mathbf{I} - 2\mathbf{J} + \mathbf{K}$.

4. Find the distance of the point $(2, 0, 1)$ from the line whose symmetric equations are

$$\frac{x-2}{3} = \frac{y+1}{4} = \frac{z-1}{-2}$$

5. A particle moves in space according to the formula $\mathbf{X}(t) = e^t \mathbf{I} + e^{2t} \mathbf{J} - t \mathbf{K}$. Find the normal acceleration at the point $t = 0$.