

Calculus III, Mathematics 2210-90

Examination 1, September 18,20, 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. On the plane, find the distance of the point $(2,3)$ from the line whose equation is $6x - y = 2$.

2. In three dimensions, find the equation of the plane through the point $P(2, -1, 3)$ and perpendicular to the line segment from P to $Q(7, 2, 0)$.

3. Find a vector $\mathbf{X}$ orthogonal to the vectors $\mathbf{V} = 2\mathbf{I} + \mathbf{K}$, $\mathbf{W} = \mathbf{I} - 2\mathbf{J} + 3\mathbf{K}$.

4. A curve in the plane is given parametrically by the equations

$$x = t^2 - 1, \quad y = t^2 - t.$$

Find the curvature of the curve at the point $(3,2)$, corresponding to $t = 2$.

5. A particle moves in space according to the formula

$$\mathbf{X}(t) = t^2\mathbf{I} + \ln t\mathbf{J} + (t^3 + t + 1)\mathbf{K} .$$

Find the tangential and normal components of its acceleration at the point $t = 1$.