

Midterm I

Math 210

September 28, 2001

Problem 1: Find a unit vector perpendicular to both $\vec{u} = \langle 1, 2, 0 \rangle$ and $\vec{v} = \langle 1, -1, 1 \rangle$.

Problem 2: Given the points $A = (1, 1, 1)$ and $B = (5, 4, 1)$

a) Find an equation of the plane Π through the point A and perpendicular to the vector \vec{AB} .

b) Find the distance from the point B to the plane Π .

Problem 3: Given the curve $r(t) = \langle 2e^t \cos t, 2e^t \sin t, e^t \rangle$

a) Find the arclength for $0 \leq t \leq 2\pi$.

b) Find the unit tangent vector at the point where $t = 0$.

Problem 4: For the function $f(x, y) = \frac{x^2 - y^3}{x^2 + y^2}$

a) Find the domain

b) Show that

$$\lim_{(x,y) \rightarrow (0,0)} \frac{x^2 - y^3}{x^2 + y^2}$$

does not exist.

Problem 5: Find all the second partial derivatives of $f(x, y) = x^2 \sin 3y$.

Problem 6: Find an equation of the tangent plane to the graph of $f(x, y) = \ln(x^2 + y^2)$ at the point $(1, 0, 0)$.