Quiz 3 Calc IV (Math2443-002) 6/12/2002

Each problem is worth 5 points. For full credit indicate clearly how you reached your answer.

1. Find an equation for the plane tangent to $f(x,y) = x^2y - y^2x + 7x$ at the point (-3,1).

$f_x(x,y) = 2yx - y^2 + 7$ $\quad f_x(-3,1) = 2(1)(-3) - (1)^2 + 7 = -6 - 1 + 7 = 0$

$f_y(x,y) = x^2 - 2xy + 0$ $\quad f_y(-3,1) = (-3)^2 - 2(-3)(1) = 9 + 6 = 15$

$z = (-3)^2(1) - (1)^2(-3) + 7(-3) = 9 + 3 - 21 = -9$

$z - z_0 = m(x - x_0) + n(y - y_0)$

$z + 9 = 0(x+3) + 15(y-1)$

$z + 9 = 15y - 15$

$15y - z = 24$

5
2
24

2. If $f(x,y) = \ln(x^2+y^2)$, find grad f(x,y).

$f(x,y) = \ln(x^2+y^2)$

take partial derivatives with respect to x and y

$f_x(x,y) = \frac{1}{x^2+y^2} \cdot 2x = \frac{2x}{x^2+y^2}$

$f_y(x,y) = \frac{1}{x^2+y^2} \cdot 2y = \frac{2y}{x^2+y^2}$

$\text{grad } f(x,y) = \langle f_x(x,y), f_y(x,y) \rangle$

$\text{grad } f(x,y) = \left\langle \frac{2x}{x^2+y^2}, \frac{2y}{x^2+y^2} \right\rangle$