Quiz 3 Calculus 3 10/8/2004

Each problem is worth 5 points. Clear and complete justification is required for full credit.

1. Find all critical points of the function $f(x,y) = x^3 + y^2 - 3x^2 + 10y + 6$.

$f_x = 3x^2 - 6x$

$0 = 3x^2 - 6x$

$0 = 3x(x-2)$

$x = 0$ or 2

$f_y = 2y + 10$

$0 = 2y + 10$

$-10 = 2y$

$y = -5$

when the partial derivatives equal zero there is a critical point

critical points are $\underline{(0,-5)}$ and $\underline{(2,-5)}$

Excellent!

2. The function $g(x,y) = 2x^3 + xy^2 + 5x^2 + y^2$ has one of its critical points at (-1, 2). Classify that critical point as a local minimum, local maximum, or saddle point.

$g_x(x,y) = 6x^2 + y^2 + 10x$ $\quad g_y(x,y) = 2xy + 2y$ $\quad$ C.P. is $(-1,2)$

$\underline{g_{xx}(x,y) = 12x + 10}$ $\quad \underline{g_{yy}(x,y) = 2x + 2}$ $\quad \underline{g_{xy}(x,y) = 2y}$

$D(-1,2) = g_{xx} \cdot g_{yy} - [g_{xy}]^2$

$D(-1,2) = [12(-1) + 10] \cdot [2(-1) + 2] - [2(2)]^2$

$-12 + 10 \quad -2 + 2 \quad - \quad 4^2$

$-2 \cdot 0 - 16$

$0 - 16$

Nice Job!

$\underline{D < 0}$ so therefor it is a S.P.