

Name: SOLUTIONS

Quiz #6 - October 15, 2004

1. Let $f(x, y) = \frac{y^2}{x}$. Find the maximum rate of change of f at the point $(2, 4)$ and the direction in which it occurs.

$$\nabla f = \left(-\frac{y^2}{x^2}, \frac{2y}{x} \right) \quad \nabla f(2, 4) = \left(-4, 4 \right)$$

Direction is $(-4, 4)$
Max rate is $|(-4, 4)| = \sqrt{32}$

2. Find the equation of the tangent plane to $x^2 - 2y^2 + z^2 + yz = 2$ at the point $(2, 1, -1)$.

$$\nabla f = (2x, -4y + z, 2z + y)$$

$$\nabla f(2, 1, -1) = (4, -5, -1)$$

$$(4, -5, -1) \cdot (x-2, y-1, z+1) = 0$$

$$4x - 5y - z = 4$$

3. Let $f(x, y) = 9 - 2x + 4y - x^2 - 4y^2$. Find any local maxima, minima or saddle points, using the 2nd derivative test to classify them.

$$\nabla f = (-2 - 2x, 4 - 8y)$$

set = 0

$$x = -1 \quad y = \frac{1}{2}$$

$$D = \begin{vmatrix} -2 & 0 \\ 0 & -8 \end{vmatrix} = 16 \quad f_{xx} = -2$$

local max at $(-1, \frac{1}{2})$