

Math 233 Warm Up Problems

September 15, 2009

1. Find the gradients of the functions

(a)

$$f(x, y) = \frac{x}{x + y^2} \quad \nabla f =$$

(b)

$$f(x, y, z) = \frac{x}{y + z^2} \quad \nabla f =$$

2. Suppose you have a function $f(x, y)$ and you know that

$$f(4, 7) = 10 \quad \frac{\partial f}{\partial x}(4, 7) = 3 \quad \frac{\partial f}{\partial x}(4, 7) = -2$$

Determine your best estimates for the following

$$\begin{array}{ll} f(5, 7) \approx & f(3, 7) \approx \\ f(4, 8) \approx & f(4, 6) \approx \end{array}$$

Lecture Problems

3. $f(x, y) = x^2y^3$

$$\begin{array}{ll} f_{xx} = & f_{xy} = \\ f_{yx} = & f_{yy} = \end{array}$$

4. $f(x, y) = x \sin(y)$

$$\begin{array}{ll} D_1 D_1 f = & D_2 D_1 f = \\ D_1 D_2 f = & D_2 D_2 f = \end{array}$$

5. $f(x, y) = \cos(xy)$

$$\begin{array}{ll} \frac{\partial^2 f}{\partial x^2} f = & \frac{\partial^2 f}{\partial y \partial x} f = \\ \frac{\partial^2 f}{\partial x \partial y} f = & \frac{\partial^2 f}{\partial y^2} f = \end{array}$$

6. Let

$$\begin{array}{l} f(x, y, z) = x + y^2 + z^3 \\ r(t) = (\sin t, \cos t, t) \\ (f \circ r)'(t) = \end{array}$$