Math 233 Warm Up Problems
September 24, 2009

1. Linearizations

(a) \( f(x, y) = x^2 - xy + y \). Find the equation of the tangent plane to the graph at the point \((-2, 1, 7)\). Write your answer as a plane in the form \( z = \).

\[ z = \]

(b) \( f(x, y) = x^2/(y + 1) \). Find the equation of the tangent plane to the graph at the point \((6, -3, -18)\). Write your answer as a plane in the form \( z = \).

\[ z = \]

Lecture Problems

2. Using the formula for linearization (or first order Taylor polynomial):

\[ L(x, y) = f(a, b) + f_x(a, b)(x - a) + f_y(a, b)(y - b) \]

find the linearizations below

(a) \( f(x, y) = x + y^2 \) at the point \((1, 7)\).

\[ L(x, y) = \]

(b) \( f(x, y) = \sin(xy) \) at the point \((1/6, \pi)\).

\[ L(x, y) = \]

3. Find the gradients of the functions

(a) \( r = \sqrt{x^2 + y^2 + z^2} \), \( \nabla r = \)

(b) \( f(x, y, z) = \sin r = \sin \sqrt{x^2 + y^2 + z^2} \), \( \nabla f = \)

4. Using the chain rule technique discussed in class, find the gradient of the functions. As usual, let \( r = \sqrt{x^2 + y^2 + z^2} \).

(a) \( f(x, y, z) = e^r \), \( \nabla f = \)

(b) \( f(x, y, z) = e^{r^2} \), \( \nabla f = \)

(c) \( f(x, y, z) = \frac{1}{r^n} \), \( \nabla f = \)