

Name _____

Homework 4
Sections 14.3 – 14.5

1. (4) Find the equation of the plane which is tangent to the graph of the function

$$f(x, y) = yx^3 - xy^2 + xy + 9y$$

at the point $(2, 3)$. Write your answer in the form $z = ax + by + c$.

2. (4 Determine the best linear approximation of $f(x, y) = x^2y^5 + 7x + 4x \ln(2 - y)$ near $(3, 1)$.

3. (4) Compute the gradient of $g(x, y) = 3x - \sin(2x - 2y) + \frac{y^2}{x}$ at $(\pi, \frac{\pi}{2})$.

4. (5) Find the directional derivative of $f(x, y) = x^2 \ln y - xy^2 + 7x$ at the point $(4, 1)$ in the direction of $\vec{v} = \frac{12}{13}\vec{i} - \frac{5}{13}\vec{j}$.

5. (4ea) The temperature (in °F), T , at a point (x, y, z) in a certain environment is given by $T(x, y, z) = (x + 2y)^2 + xz - yz^3 + 5y$, where x , y , and z are measured in feet.
[Be sure to include units in the answers to the following if appropriate.]

- (a) If a bug is at the point $(6, 1, 2)$, in what direction does the bug need to fly in order to experience the most rapid increase in temperature?

- (b) If a bug leaves the point $(6, 1, 2)$ and instead heads in a straight line toward the point $(9, 0, 4)$, what is the rate of change in temperature that the bug is experiencing as it leaves $(6, 1, 2)$?