

Activity 8: Chain Rule and Gradient

Names: _____ Date: November 18, 2009 Score: _____

Show your work or explain your answer for each of the following. You should submit one copy for your group. Feel free to ask your instructor for advice if you need it.

1. (2 pts) Is the quadratic form $p(x, y, z) = x^2 + y^2 + 3z^2 + 4xy + 2xz$ positive definite, negative definite, indeterminate, or none of the above?

2. (3 pts each) Consider the function $f(x, y) = \frac{3x^2+1}{2} - x(x^2 + y^2)$.

(a) Find the direction in which f changes the fastest away from $(3, 4)$.

(b) Find the plane tangent to the surface of given by the graph of f at the point $(3, 4, f(3, 4))$.

(c) Find the Taylor polynomial of degree 2 for f at $(3, 4)$.

(d) Find the critical points of f .

(e) Determine if the critical points of f are maxima, minima, or saddles if possible.

3. (3 pts) Set up the integral of the function $f(x, y, z) = z \cos(x^2y)$ along the line segment from $(1, 2, 3)$ to $(3, -5, 7)$.

4. (bonus) Find the distance from the point $(1, 2, 3)$ to the plane $4x + 5y + 6z = 7$.