

Third Examination
Tuesday, March 18, 2008

Instructions: This exam should be done on your own paper. Your name should be on each sheet and on the back of the last sheet; the answers should appear written carefully and in order. If in doubt, show intermediate steps: Full credit may not be given, even for correct answers, unless work is arranged clearly and explained. This exam is closed book. You may leave after handing in your exam paper, but be sure to check your answers carefully. You may keep this copy of the exam questions. Each entire problem is worth 25 points.

1. If

$$f(x, y) = xe^{-xy},$$

then compute

$$(a) \frac{\partial f}{\partial x}, \quad (b) \frac{\partial f}{\partial y}, \quad (c) \frac{\partial^2 f}{\partial x^2}, \quad (d) \frac{\partial^2 f}{\partial y^2}, \quad \text{and} \quad (e) \frac{\partial^2 f}{\partial x \partial y}.$$

2. Suppose you are hiking on a mountain. You have an altimeter, a compass, and a balance to measure angles. Suppose, at a point on the mountain, you measure your altitude to be 7135 ft. Also suppose that, using the compass and balance, you measure your rate of increase of altitude to be 1200 feet per 5000 feet traveled as you go east and 2500 feet per 5000 feet traveled as you go north. What will be your approximate change in altitude if you head southeast for 100 feet?

3. The altitude of a particular surface at point (x, y) is given as

$$A(x, y) = x^2 - 2y^2,$$

while an object moving along the surface has coordinates $x(t) = t^2 - 1$, $y(t) = t^3$ at time t . What is the instantaneous rate of change of altitude of the object at time $t = 2$?

4. Write down an equation for the tangent plane to the function in Problem 1 at the point $(x_0, y_0) = (1, 0)$.