

Math 53, Spring 2000, sections 107 & 109  
Quiz #6, 25 February

Name\_\_\_\_\_

Instructions: You have 20 minutes in which to answer the questions on BOTH pages of this quiz. No calculators, notes, or other references may be used.

For each of these questions, let  $f(x, y) = e^x y^2 + x^y$ .

1. (2 points) Find the gradient of  $f$ .

2. A particle follows a path parametrized by

$$x = 10 + 7 \cos(t)$$

$$y = 2 + \sin(t).$$

(a) (2 points) Find a unit vector  $u$  representing the direction in which the particle is moving at time  $t = \frac{\pi}{4}$ .

(b) (2 points) Find the directional derivative of  $f$  at the point  $(10 + \frac{7\sqrt{2}}{2}, 2 + \frac{\sqrt{2}}{2})$  in the direction given by  $u$ .

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(c) (3 points) Find the derivative  $\frac{df}{dt}$  in terms of  $t$ .

(d) (1 point) Evaluate  $\frac{df}{dt}$  at  $t = \frac{\pi}{4}$ .

3. (0 points) How are your answers to part (b) and part (d) related?