

**Math 173 - Quiz 6**

March 1, 2012

Name key

Score \_\_\_\_\_

Show all work to receive full credit. Supply explanations when necessary.

1. (2 points) Find the limit:

$$\lim_{(x,y) \rightarrow (0,0)} \frac{x-y}{\sqrt{x}-\sqrt{y}} \cdot \frac{\sqrt{x}+\sqrt{y}}{\sqrt{x}+\sqrt{y}}$$

$$= \lim_{(x,y) \rightarrow (0,0)} \frac{(x-y)(\sqrt{x}+\sqrt{y})}{(x-y)} = \lim_{(x,y) \rightarrow (0,0)} \sqrt{x} + \sqrt{y}$$

$$= 0 + 0 = \boxed{0}$$

2. (2 points) Show that the limit does not exist:

$$\lim_{(x,y) \rightarrow (1,1)} \frac{x^2 - y}{x - y}$$

Along  $y=1$ :  $\lim_{x \rightarrow 1} \frac{x^2 - 1}{x - 1} = \lim_{x \rightarrow 1} \frac{(x-1)(x+1)}{(x-1)} = \lim_{x \rightarrow 1} (x+1) = 2$

Along  $x=1$ :  $\lim_{y \rightarrow 1} \frac{1 - y}{1 - y} = \lim_{y \rightarrow 1} 1 = 1$

} Two different limits along two paths.

3. (2 points) Given  $f(x, y) = \frac{xy}{x^2 - y}$ , evaluate  $f_x$  at the point (2, 2). LIMIT DNE.

$$f_x(x, y) = \frac{(x^2 - y)(y) - (xy)(2x)}{(x^2 - y)^2}, \quad f_x(2, 2) = \frac{(2)(2) - (4)(4)}{2^2}$$

$$= \boxed{-3}$$

4. (2 points) Given  $g(x, y) = 2xe^y - 3ye^{-x}$ , determine  $g_{yx}$ .

$$g_y(x, y) = 2xe^y - 3e^{-x}$$

$$g_{yx}(x, y) = 2e^y + 3e^{-x}$$

5. (2 points) Refer to the problem above and find the total differential for  $z = g(x, y)$ .

$$dz = (2e^y + 3ye^{-x})dx + (2xe^y - 3e^{-x})dy$$