

Name \_\_\_\_\_

KEY

Math 254, Quiz #5, Summer 2012

**Instructions:** Show all work. Use exact answers except in word problems or when specifically asked to round.

1. Find all first partial derivatives of  $f(x, y, z) = 3x^3y^2z^4 + \cosh(xz)$ . Then find  $f_{xyzzyx}$ .

$$f_x = 9x^2y^2z^4 + \sinh(xz)z$$

$$f_y = 6x^3yz^4$$

$$f_{xy} = 18x^2yz^4$$

$$f_z = 12x^3y^2z^3 + \sinh(xz)x$$

$$f_{xyz} = 72x^2yz^3$$

$$f_{xyzz} = 216x^2yz^2$$

$$f_{xyzzy} = 216x^2z^2$$

$$f_{xyzzyx} = 432xz^2$$

2. Use the information obtained from Problem #1 to find the total differential for the problem at for the change from  $f(1, 2, 0)$  to  $f(1.5, 1.8, 0.1)$ .

$$f_y = 6x^3yz^4 \quad f_y(1, 2, 0) = 0$$

$$f_x = 9x^2y^2z^4 + \sinh(xz)z \quad f_x(1, 2, 0) = 0 + 0 = 0$$

$$dw = 0 \\ = dx \cdot f_x + dy \cdot f_y + dz \cdot f_z$$

$$f_z = 12x^3y^2z^3 + \sinh(xz)x \quad f_z(1, 2, 0) = 0 + 0 = 0$$

3. Find the first implicit partials for  $z^2 + 2xy + e^{-z \sin y} - 5 \arctan z = 16$  by any means.

$$f_x = 2y$$

$$f_y = 2x + e^{-z \sin y} \cdot z \cos y$$

$$f_z = 2z + e^{-z \sin y} \sin y - \frac{5}{1+z^2}$$

$$\frac{\partial z}{\partial x} = \frac{-2y}{2z + e^{-z \sin y} \sin y - \frac{5}{1+z^2}}$$

$$\frac{\partial z}{\partial y} = \frac{-2x - e^{-z \sin y} z \cos y}{2z + e^{-z \sin y} \sin y - \frac{5}{1+z^2}}$$