# Math 173 - Quiz 5

March 7, 2013

Name key

Score _____

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

1. (3 points) Let $g(x,y) = \ln(x\sqrt{x^2+y^4})$. Find $g_x$ and $g_y$.

$$g(x,y) = \ln x + \tfrac{1}{2}\ln(x^2+y^4)$$

$$g_x(x,y) = \frac{1}{x} + \frac{x}{x^2+y^4} \qquad g_y(x,y) = \frac{2y^3}{x^2+y^4}$$

2. (2 points) Let $f(x,y,z) = e^{-x}\sin(yz)$. Find the mixed partial derivative $f_{yzy}$.

$$f_y = ze^{-x}\cos(yz)$$

$$f_{yy} = -z^2e^{-x}\sin(yz)$$

$$f_{yyz} = -2ze^{-x}\sin(yz) + \left(-z^2ye^{-x}\cos(yz)\right) = f_{yzy}$$

3. (3 points) Let $w = 3xy^2z^3 + e^{-x^2y}$. Find the total differential $dw$.

$$dw = \left(3y^2z^3 - 2xye^{-x^2y}\right)dx + \left(6xyz^3 - x^2e^{-x^2y}\right)dy + 9xy^2z^2\,dz$$

4. (2 points) Refer to the problem above. Use differentials to approximate $\Delta w$ as $(x,y,z)$ changes from $(0,1,2)$ to $(0.01, 0.97, 2.02)$.

| $x, y, z$ | $\Delta x, \Delta y, \Delta z$ |
|---|---|
| | $0.01, -0.03, 0.02$ |

$$\Delta w \approx 3(1)(8)(0.01) + 0 + 0 = \underline{\underline{0.24}}$$