Math 1712 - Spring 2013
Quiz 6 - Show Your Work

Name: _____

1. (10 points) The wind speed S, in mph, of a tornado at a distance of d feet from the center is given by:
$S(d, V) = \dfrac{0.78\ V}{0.51\ d^2}$ where V is the volume of the tornado. a. Find the speed of the wind at a distance of 100 feet, if the tornado's volume is $2,000,000\ ft^3$. b. At what distance d from the center of the tornado is the speed of the wind 200 mph if the volume of the tornado is the same as in part a? Round to two decimal places and use the correct units.

a. $S(100, 2\ M) = \dfrac{0.78 \cdot 2000000}{0.51 \cdot 100^2} = 305.88\ mph$

b. $200 = S(d, 2\ M) = \dfrac{0.78 \cdot 2000000}{0.51 \cdot d^2} \Rightarrow d = \sqrt{\dfrac{0.78 \cdot 2000000}{0.51 \cdot 200}} = 123.67\ feet$

2. (10 points) Find the indicated partials

a. $f(x,y) = y \ln(xy)$; find the first partials

$f_x(x, y) = \dfrac{y}{x} \qquad f_y(x, y) = 1 + \ln(xy)$

b. $g(x, y) = y\, e^x - e^{xy}$. Find g_{yy}

$g_y = e^x - xe^y \Rightarrow g_{yy} = x^2 e^{xy}$

3. (10 points) Company XYC, Inc finds that it ptoduction function is given by the Cobb-Douglas $P(L, C) = 1800\ L^{0.62}\ C^{0.38}$, where P is the number of units produced when L units of labor and C units of capital are used. Find the marginal productivity of labor and the marginal productivity of capital if the company uses 2500 units of labor and 1700 units of capital. Round to two decimals places.

$MPL = P_L = 1800 \cdot 0.62\ L^{-0.38}\ C^{0.38} = 1116\ \dfrac{C^{0.38}}{L^{0.38}}$

$\Rightarrow MPL(2500, 1700) = 1116 \cdot \dfrac{1700^{0.38}}{2500^{0.38}} = 963.87\ units$

$MPC = P_C = 1800 \cdot 0.38\ \dfrac{L^{0.62}}{C^{0.62}} = 684\ \dfrac{2500^{0.62}}{1700^{0.62}} = 868.76$