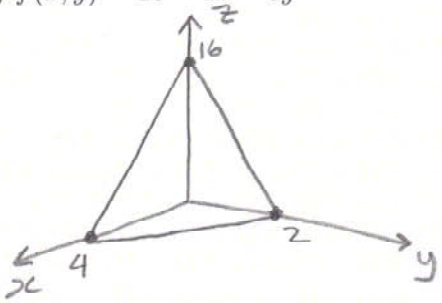
MATH 203 QUIZ 5 - Version A
June 19, 2014

Name: ANSWERS

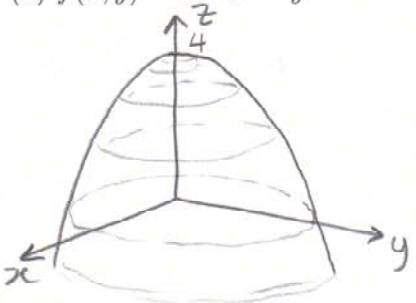
Instructions: (1) No calculators! (2) Use your own scrap paper. Write your answers in the space provided.

1. Sketch the graph of the given function:

(a) $f(x,y) = 16 - 4x - 8y$



(b) $f(x,y) = 4 - x^2 - y^2$



2. For a function $f(x,y)$, define, using limits, $\frac{\partial f}{\partial x}$. $f_x = \lim_{h\to 0} \frac{f(x+h,y) - f(x,y)}{h}$

3. For a function $f(x,y)$, write the formula for the tangent plane at (x_0, y_0). You may use $f_x = f_x(x_0, y_0)$ and $f_y = f_y(x_0, y_0)$

$z - z_0 = f_x(x - x_0) + f_y(y - y_0)$

4. Find the equation of the tangent plane to the function $f(x,y) = 3x + 2x^2y - 4xy^3$ at the point where $x = 2$ and $y = 1$.

$z - 6 = 7(x-2) - 16(y-1)$

5. Find the indicated partial derivatives of $f(x,y,z) = x^y + ze^{-x}\cos y$

(a) $f_x = yx^{y-1} - ze^{-x}\cos y$ (b) $f_y = x^y \ln x - ze^{-x}\sin y$

(c) $f_{xz} = -e^{-x}\cos y$ (c) $\frac{\partial^2 f}{\partial x \partial y} = yx^{y-1}\ln x + x^{y-1} + ze^{-x}\sin y$

$\frac{x^y}{x}$ acceptable

6. What is the formula for the linearization of $f(x,y)$ at the point (a,b)?

$L(x,y) = f(a,b) + f_x(x-a) + f_y(y-b)$ [f_x and f_y evaluated at (a,b)]

7. Let $f(x,y) = \sqrt{x^2+y^2}$. Use linearization (or differentials) to approximate $f(4.1, 2.9)$.

$f(4.1, 2.9) \approx 5 + \frac{1}{50} = \frac{251}{50}$

Bonus 1: Suppose $z = f(x,y)$, $x = x(s,t)$ and $y = y(s,t)$: $\frac{dz}{dt} = \frac{\partial f}{\partial x}\frac{\partial x}{\partial t} + \frac{\partial f}{\partial y}\frac{\partial y}{\partial t}$ (may use z instead of f)

Bonus 2: Let $F(x,y,z) = 0$ be an implicitly defined function. $\frac{dz}{dx} = -\frac{F_x}{F_z}$