MATH 203 QUIZ 5 - Version B
June 19, 2014

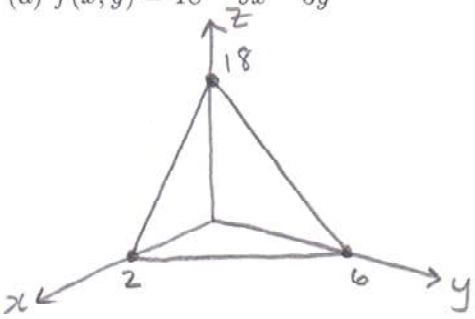
Name: ANSWERS

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

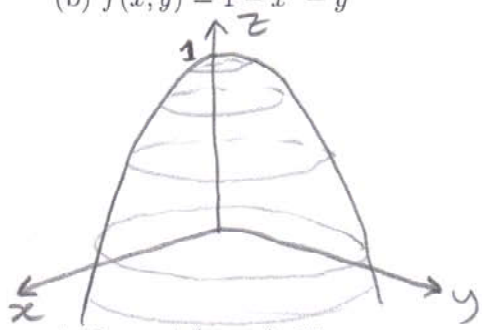
1. For a function $f(x,y)$, define, using limits, $\frac{\partial f}{\partial y}$. $f_y = \lim_{h\to 0} \frac{f(x,y+h)-f(x,y)}{h}$

2. Sketch the graph of the given function:

(a) $f(x,y) = 18 - 9x - 3y$



(b) $f(x,y) = 1 - x^2 - y^2$



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 $f(x,y) = 2y + 2x^2y^3 - 4x^2y$ at the point where $x = 2$ and $y = 1$.

$z + 6 = -8(x-2) + 10(y-1)$

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

(a) $f_x = y^x \ln y + e^{-z}\cos y$ (b) $f_y = xy^{x-1} - xe^{-z}\sin y$

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

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 $f(3.1, 4.1)$.

$f(3.1,4.1) \approx 5 + \frac{7}{50} = \frac{257}{50}$

Bonus 1: Suppose $z = f(x,y)$, $x = x(s,t)$ and $y = y(s,t)$: $\frac{dz}{ds} = \frac{\partial z}{\partial x}\frac{\partial x}{\partial s} + \frac{\partial z}{\partial y}\frac{\partial y}{\partial s}$

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