Math 203 Quiz 8B
October 27, 2015

Name: ANSWERS

Instructions: No calculators! Answer all problems in the space provided!

1. Suppose $F(x,y,z) = 0$ defines a level surface. Write down an equation for the tangent plane to $F(x,y,z) = 0$ at the point (x_0, y_0, z_0). $F_x(x-x_0) + F_y(y-y_0) + F_z(z-z_0) = 0$ (F_x, F_y, F_z evaluated at (x_0, y_0, z_0))

2. Find an equation of the tangent plane to the surface $x + yz^2 = 6e^{xyz}$ at the point $(6,0,1)$.

   $(x-6) - 35y = 0$

3. Given a function $f(x,y)$, what criteria must be fulfilled for the function to have critical point(s)?

   $f_x = 0$ and $f_y = 0$ or f_x and/or f_y undefined

4. What is the function "D", used to classify the critical points of $f(x,y)$? $D =$ $f_{xx} f_{yy} - (f_{xy})^2$

5. Find the classify the critical points of $f(x,y) = xy(x+y-1)$. (No credit for classification if the wrong critical point is given. So solve for them carefully!)

   Critical point 1: $(0, 0)$ Classification saddle point

   Critical point 2: $(0, 1)$ Classification saddle point

   Critical point 3: $(1, 0)$ Classification saddle point

   Critical point 4: $(\frac{1}{3}, \frac{1}{3})$ Classification minimum point

6. For the function above, find the absolute max and min on the region bounded by $x = 0$, $y = -x$ and $y = 1$.

   Absolute max $f(-1,1) = 1$ Absolute min $f(0,0) = f(0,1) = 0$

Bonus Problems:

1. Evaluate the integral. Hint: it may be helpful to reverse the order of integration.

$$\int_0^1 \int_y^1 e^{y/x}\, dx\, dy = \frac{e-1}{2}$$

2. Set up an integral to compute the volume of the solid in the first octant bounded by the cylinder $z = 16 - y^2$ and the plane $x = 5$.

   Integral set-up: $\int_0^5 \int_0^4 16 - y^2\, dy\, dx$ or $\int_0^4 \int_0^5 16 - y^2\, dx\, dy$ Volume: $\frac{640}{3}$