Midterm 2 In Class Review Problems (No solutions provided, but you can ask about anything before the mindterm)

1. Find the global maximum value and global minimum value of $f(x,y) = x^2 + 3y - 3xy$ on the region bounded by y=x, y=0, and x=2.

2. A box (with a top) is to be constructed out of 96 square feet of material. In order to reinforce it, the bottom will be two layers thick. Find the dimensions that maximize the volume of the box.

3. Use the chain rule to find $\frac{\partial f}{\partial u}$ if $f(x,y) = x^2 + 2y^2$ and $x = \sin u \cos v$, $y = \sin u \sin v$.

4. Evaluate $\lim_{(x,y)\to(0,0)} \frac{x-7y}{x+y}$ or show that it doesn't exist.

5. Find all the critical points of $f(x,y) = x \sin y$ and indicate whether each is a local maximum, local minimum, or saddle point.

6. Find the equation of the tangent plane for the surface $z = x^2 + 2xy - y^2$ at (1,-2,-7).

7. Find the minimum distance between the point (1,2) and the surface $y = x^2 - 1$. (the x- and y-coordinates of the point on the parabola that is of minimum distance are solutions of a cubic equation….not easy to find. For us, the set-up of this problem is important. Once you reach an equation in terms of x or y alone, move on.)

8. Use the total differential to approximate the change in z as (x,y) moves from P to Q. $z = x^2 + 6xy + y$ where P(5,5), Q(5.01,4.98).

9. Find the maximum and or /minimum values of $f(x,y) = 4x^2y$ subject to the constraint $x^2 + y^2 = 3$

10. Find all the critical points of $f(x,y) = 2x^2 + y^3 - x^2y - 3y$ and indicate whether each is a local maximum, local minimum, or saddle point.

11. Find the equation of the tangent line to the curve of intersection of the surface $z = x^2 + 2xy - y^2$ and the plane $x = 1$ at the point (1,-2,-7).

12. Compute the integral

$\iint_R (1 - xe^{xy})dA$ where $R = \{0 \le x \le 3, 0 \le y \le 2\}$

13. Use the chain rule to find $\frac{df}{dt}$ if $f(x,y) = x^2 - 2xy + y^2$ and $x = 4 - 3t$, $y = 2t + 1$

14. Find the directional derivative of $f(x,y) = x^2 - 2y^2$ at (3,1) in the direction of $\boldsymbol{u} = 2\boldsymbol{i} + 3\boldsymbol{j}$.

15. Find the first four second partial derivatives for $f(x,y) = 2x^2y^3 + 10e^{xy}$.