

**Exam 2**

Prob.	1	2	3	4	5	6	
Value	20	10	15	15	20	20	100
Points							

Show all work for credit. Answers with little or no supporting work will receive little or no credit.

1. Find the indicated derivatives:

(a) Find  $\frac{\partial z}{\partial x}$  and  $\frac{\partial z}{\partial y}$  given,  $z = y^2 e^{\cos x}$  at the point  $(0, -2)$ .

(b) Find  $\frac{\partial z}{\partial x}$  given,  $xz^3 = \sin(x^2 + y^2 + z^2) + 4y^2$

2. Let  $f(x, y) = e^x \cos(xy)$ . Find the linearization,  $L(x, y)$ , of  $f(x, y)$  at the point  $(\pi, 0)$ .

3. Sketch and label the level curves of  $z = x^2 - y^2$  for  $k = -1, 0, 1$ .

4. Car A is travelling north on 19th street and Car B is travelling west on College. Each car is approaching the intersection of these roads. At a certain time car A is 0.3 km from the intersection travelling at 90 km/h while car B is 0.4 km from the intersection and travelling at 80 km/h. How fast is the distance between the cars changing at that point?

5. Suppose that the temperature at a point  $(x, y, z)$  in space is given by  $T(x, y, z) = 80/(1 + x^2 + 2y^2 + 3z^3)$ , where  $T$  is measured in degrees Celsius and  $x, y, z$  in meters.

(a) In which direction does the temperature increase fastest at the point  $(1, 1, -2)$ ?

(b) What is the maximum rate of increase?

6. Find the dimensions of a rectangular box with maximum volume such that the sum of the lengths of the 12 edges is 120 inches.