

# Chapter 15 Review

Show your work on a separate sheet of paper

Find the following limits:

1)  $\lim_{(x,y) \rightarrow (0,0)} \frac{x^z}{x^2+y^2}$

2)  $\lim_{(x,y) \rightarrow (0,0)} \frac{x y \cos y}{3x^2 + y^2}$

~~lim~~

3)  $\lim_{(x,y) \rightarrow (0,0)} \frac{x^2 + 3xy + 2y^2}{x+y}$

4)  $\lim_{(x,y) \rightarrow (0,0)} \frac{2x^2y}{x^4+y^2}$

Compute the tangent planes at the following points:

5)

$f(x,y) = \cos(x+y)$  at  $(0,0)$ ,  $(\frac{\pi}{2}, 0)$

(Which do you think would give a better approximation for  $(1.6, 0)$ ?)

at  $(-2, 1)$

6) Use linear approximation to estimate  $f(-2.01, .99)$

$f(x,y) = e^{x+2y}$

7) Find  $\frac{\partial f}{\partial s}, \frac{\partial f}{\partial t}$

$$f(x, y) = \cos(3x + 4y) + 10xy$$

$$x = s + 3t$$

$$y = 2s^2 + 7t^3 + 1$$

Find  $\frac{dg}{dt}$

8)  $g(x, y, z) = e^{x^2 + y^2 + z}$

$$x = 3t + 1$$

$$y = 2 - t$$

$$z = t^2 - t - 1$$

9) Find  $\frac{\partial z}{\partial x}, \frac{\partial z}{\partial y}$  when  $z^2 + y^2 + x^2 = 4x$

Find the directional derivative of  $g(x, y, z) = e^{x^2 + y^2 + z}$  in the direction  $\langle \frac{1}{2}, 1, 2 \rangle$  at  $(0, 1, 0)$

Find the min/max of

$$10) \quad f(x,y) = x^2 + xy + x - \frac{y^3}{3} + y + 5$$

on the <sup>filled in</sup> square with side lengths of 2 centered about the origin.

Find the min/max of

$$11) \quad f(x,y) = 3x^2 + ~~xy~~ + y^2 + 5$$

On the circle of radius 2 centered at (0,1)

## Chapter 15 Supplementary Questions

12)  $\lim_{(x,y) \rightarrow (0,0)} xy \sin\left(\frac{1}{x^5+y^8}\right)$

Classify all critical points of

13)  $f(x,y) = 2xy e^{-\frac{4x^2+y^2}{8}}$

(Using the second derivative test)

Find the min/max of

14)  $f(x,y,z) = xyz$  on the ellipsoid  $x^2+y^2+2z^2=1$

Find the min/max of

15)  $g(x,y,z) = x + \frac{5}{4}x$   
given the constraints

$$x+y+z=12$$

$$4y^2+9z^2=36$$

16) Find the point on the curve  $x^2+xy+y^2=3$   
Closest to the origin.