Math 8

Partial Derivatives & Tangent Planes

## Practice Problems

1) Compute $f_x$ and $f_y$ for the following functions.

a) $f(x,y) = (2x+3y)^{10}$ b) $f(x,y) = \dfrac{e^{-x}}{(x+y^2)}$ c) $f(x,y) = \arctan(x\sqrt{y})$

2) Compute the following limit or show that it does not exist.

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

3) Find $f_{xy}$ where

$$f(x,y) = \sin\left(\cos\left(\tan\left(\frac{x^2+x}{x+2}\right)\right)\right) + e^{xy}\sin(y).$$

(Hint: There is an easy way to do this!)

4) Find the equation for the tangent plane of $f(x,y) = \dfrac{x}{(x+y)}$ at $(2,1)$.

5) Let $f(x,y) = x^2 - xy + 3y^2$. Using tangent planes, estimate $f(2.96, -.95)$. Compare your estimate to the correct answer (you may use a calculator to do this).

## Problem to Turn In

1) Let $f(x,y)$ be a surface, that contains the point (2,1,3). Further, assume that

$$r(t) =< 2+3t, 1-t^2, 3-4t+t^2 >$$

and

$$s(u) =< 1+u^2, 2u^3-1, 2u+1 >$$

are curves that lie on the surface $f(x,y)$. Find the plane tangent to $f(x,y)$ at the point $(2,1,3)$.