100	90's	80's	70's	60's	<60
1	4	8	1	8	0

8.12

Assessment 2
Dusty Wilson
Math 254

Name: key

... arithmetic has a very great and elevating effect, compelling the soul to reason about abstract number, and rebelling against the introduction of visible or tangible objects into the argument.

Plato
circa 428-348 BC (Greek Philosopher)

No work = no credit
No CAS Calculators

Warm-ups (1 pt each): $-3^2 = \underline{-9}$ $\qquad \frac{\partial}{\partial z} xy = \underline{0}$ $\qquad \frac{d}{dx}\tan(x) = \underline{\sec^2 x}$

1.) (1 pt) The quote by Plato (above) is from the same book as the Allegory of the Cave. According to Plato, what is it about numbers that distinguishes them from visible or tangible objects? Answer using complete English sentences.

Numbers are abstract (ideas).

2.) (1 pt) Slack posting: What random number am I thinking of? $\underline{95}$

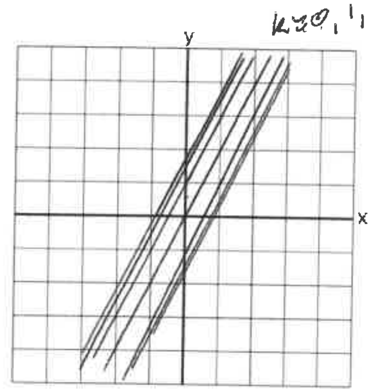
3.) (10 pts) Carefully sketch a contour map of $f(x,y) = (y-2x)^2$ with four labeled contour lines.

$0 = (y-2x)^2$
$\Rightarrow 0 = y - 2x$
$\Rightarrow y = 2x$

$1 = (y-2x)^2$
$\Rightarrow \pm 1 = y - 2x$
$\Rightarrow \pm 1 + 2x = y$

$2 = (y-2x)^2$
$\Rightarrow 2x \pm \sqrt{2} = y$

$k = 0, 1, 2, 3$



4.) (10 pts) Find the equation of the tangent plane to the surface $f(x,y) = 3 + \ln(2x-3y)$ at the point $(2,1,\cancel{0}\,3)$.

$f_x(x,y) = \frac{2}{2x-3y}\Big|_{(2,1)} \quad \frac{2}{1}$

$f_y(x,y) = \frac{-3}{2x-3y}\Big|_{(2,1)} \quad \frac{-3}{1}$

$L(x,y) = 3 + 2(x-2) - 3(y-1)$

5.) (10 pts) If $z = 3x^2 + 4y^2$ and (x, y) changes from $(2,1)$ to $(1.9, 1.05)$, compare the values of Δz and dz. (Round your answers to four decimal places.)

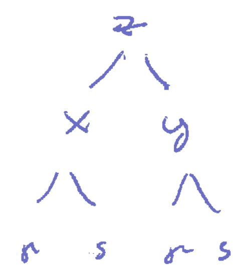
$$\Delta z = z(1.9, 1.05) - z(2,1) = -0.76 \quad \text{(exact change)}$$

$$dz = \underbrace{\frac{\partial z}{\partial x}}_{6x\big|_{x=2} \;\; 12} \underbrace{dx}_{(-0.1)} + \underbrace{\frac{\partial z}{\partial y}}_{8y\big|_{y=1} \;\; 8} \underbrace{dy}_{(0.05)}$$

$$= 12(-0.1) + 8(0.05)$$

$$= -0.8 \quad \text{(approx change)}$$

6.) (10 pts) If $z = \sin(xy)$ where $x = r^2 + s^2$ and $y = 5rs$, use the multivariate chain rule to find $\frac{\partial z}{\partial s}$. You may assume that all the given functions have continuous second-order partial derivatives.



$$\frac{\partial z}{\partial s} = \frac{\partial z}{\partial x}\frac{\partial x}{\partial s} + \frac{\partial z}{\partial y}\frac{dy}{ds}$$

$$= y\cos(xy)\cdot 2s + x\cos(xy)\cdot 5r$$

$$= 5rs\cos((r^2+s^2)5rs)\cdot 2s + (r^2+s^2)\cos(5rs(r^2+s^2))5r$$

$$= 10rs^2\cos(5rs(r^2+s^2)) + 5r(r^2+s^2)\cos(5rs(r^2+s^2))$$