Quiz 4

Problem 1 Find the following limit, if it exists:

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

$=0$ along $x=0$

$=0$ along $y=0$

$=0$ along $y=x$

$\lim_{(x,y)\to(0,0)}$

$$0 \le \left|\frac{3x^2y}{x^2+y^2}\right| \le 3|y| \left|\frac{x^2}{x^2+y^2}\right| \le 3|y| \cdot 1 = 3|y|$$

Now, observe that $\lim_{(x,y)\to(0,0)} 0 = 0$ and $\lim_{(x,y)\to(0,0)} 3|y| = 0$.

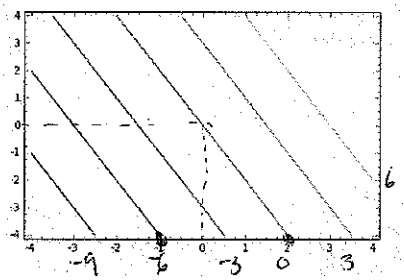
By the squeeze theorem, then

$$\lim_{(x,y)\to(0,0)} \left|\frac{3x^2y}{x^2+y^2}\right| = 0.$$

and thus

$$\lim_{(x,y)\to(0,0)} \frac{3x^2}{x^2+y^2} = \pm 0 = 0.$$

Problem 2 Find the equation of the linear function whose contour plots are given below:



The leftmost line corresponds to $c = -9$ and the rightmost corresponds to $c = 6$.

I need three points (not in the same line)

$(0,0,0)$
$(2,-4,0)$) find displacement vectors and find the normal vector.
$(-1,-4,-6)$

$\vec{n} = \langle 2,-4,0\rangle \times \langle -1,-4,-6\rangle = \langle 24, 12, -12\rangle$

$\vec{n} \cdot \langle 24, 12, -12\rangle \cdot \langle x, y, z\rangle = 0$

$24x + 12y - 12z = 0$

$\boxed{2x + y = z}$

Lots of other ways too.

eg find 4 points and solve for a, b, c, d in $ax + by + cz = d$.