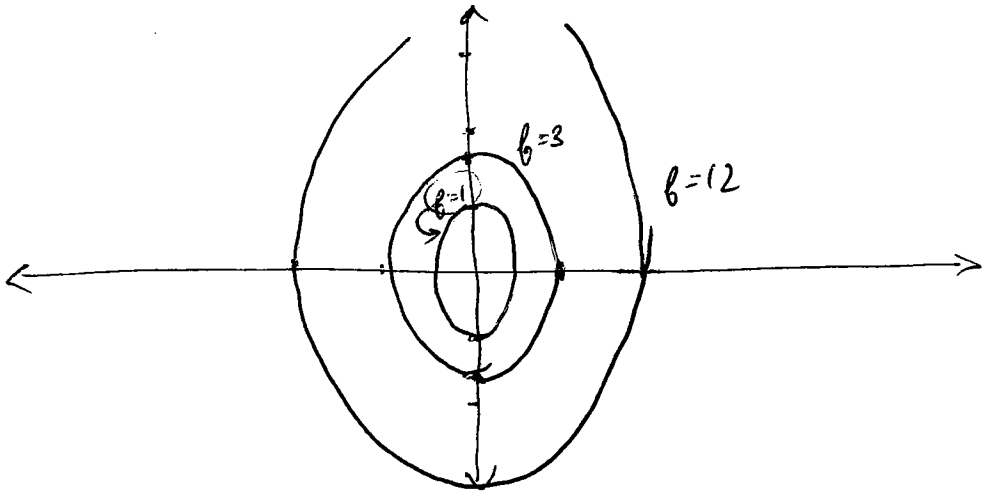
Quiz 1

Name: key

[4] **1.** Give a rough sketch of a few of the level curves of the function $f(x,y) = 3x^2 + y^2$.



[8] **1.** Find the first partial derivatives of the function

5 **a.** $f(x,y) = e^{y/x}$

$$\frac{\partial f}{\partial x} = e^{y/x}\,\frac{\partial}{\partial x}\left(\frac{y}{x}\right) = e^{y/x}\cdot\left(\frac{-y}{x^2}\right) \quad (3)$$

$$\frac{\partial f}{\partial y} = e^{y/x}\,\frac{\partial}{\partial y}\left(\frac{y}{x}\right) = e^{y/x}\cdot\left(\frac{1}{x}\right) \quad (2)$$

3 **b.** $f(x,y,z) = x^2yz^3$

$$f_x = 2xyz^3, \quad f_y = x^2z^3, \quad f_z = 3x^2yz^2$$

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[8] **2.** If z is given implicitly as a function of x and y by $\sin(x^2+y^2+z^2) - 3xz = 0$, use implicit differentiation to find $\partial z/\partial x$.

$$\frac{\partial}{\partial x}\left[\sin(x^2+y^2+z^2) - 3xz\right] = 0 \quad (2)$$

$$\Rightarrow \cos(x^2+y^2+z^2)\cdot\left(2x+0+2z\frac{\partial z}{\partial x}\right) - 3\left(1\cdot z + x\cdot\frac{\partial z}{\partial x}\right) = 0 \quad (1)\ (2)$$

$$\Rightarrow \cos(x^2+y^2+z^2)\cdot 2z\frac{\partial z}{\partial x} - 3x\frac{\partial z}{\partial x} = 3z - \cos(x^2+y^2+z^2)\cdot 2x \quad (1)$$

$$\Rightarrow \frac{\partial z}{\partial x} = \frac{-\cos(x^2+y^2+z^2)\cdot 2x + 3z}{\left[-3x + \cos(x^2+y^2+z^2)\cdot 2z\right]} \quad (2)$$