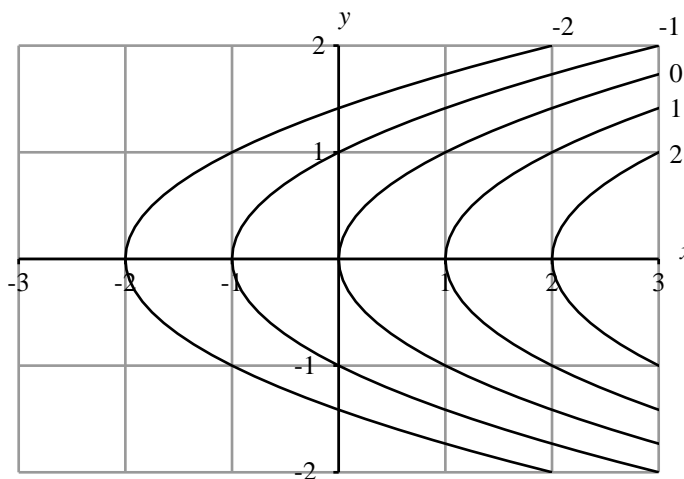


1. Draw a contour plot of the function given by $f(x, y) = x - y^2$ on the axes provided. Include the level curves for $-2, -1, 0, 1$, and 2 . Label each curve.



2. Let $f(x, y) = \frac{xy}{x^2 + y^2}$. Find $\lim_{(x,y) \rightarrow (0,0)} f(x, y)$ where the limit is taken along the line $y = 2x$.

Solution: The one-variable limit here is

$$\begin{aligned} \lim_{x \rightarrow 0} \frac{x(2x)}{x^2 + (2x)^2} &= \lim_{x \rightarrow 0} \frac{2x^2}{x^2 + 4x^2} \\ &= \lim_{x \rightarrow 0} \frac{2x^2}{5x^2} \\ &= \frac{2}{5}. \end{aligned}$$

3. Given $f(x, y) = x^2 e^{y-3x}$, compute $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$.

Solution: We have

$$\begin{aligned} \frac{\partial f}{\partial x} &= -3x^2 e^{y-3x} + 2x e^{y-3x} \\ \frac{\partial f}{\partial y} &= x^2 e^{y-3x} \end{aligned}$$