

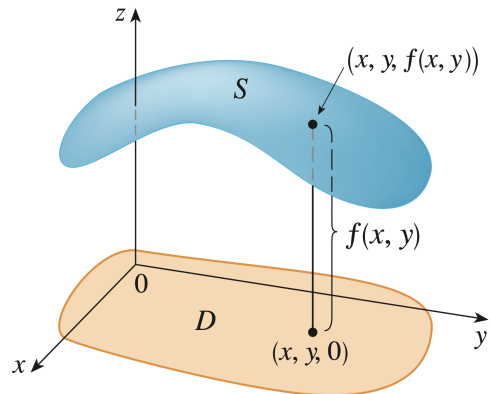
9.6 Functions and Surfaces

Definition. What is a function of two variables?

Example. If $f(x, y) = 4x^2 + y^2$, what are the domain and range of $f(x, y)$?

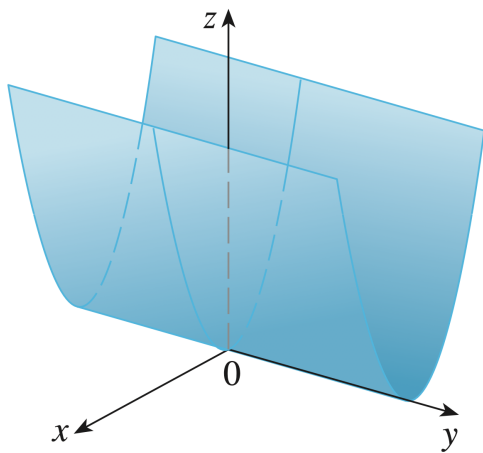
Example. If $f(x, y) = \frac{\sqrt{x+y+1}}{x-1}$, evaluate $f(3, 2)$ and find and sketch the domain.

Definition. If f is a function of two variables with domain D , what is the graph of f ?



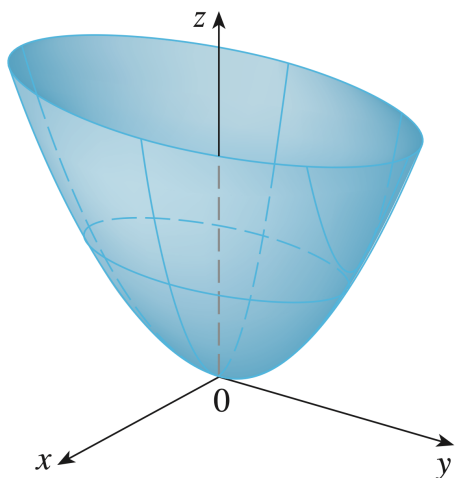
Example. Sketch the graph of the function $f(x, y) = 6 - 3x - 2y$.

Example. Sketch the graph of the function $f(x, y) = x^2$.

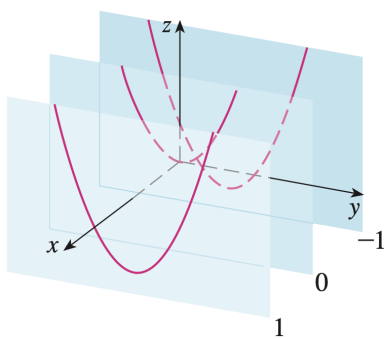
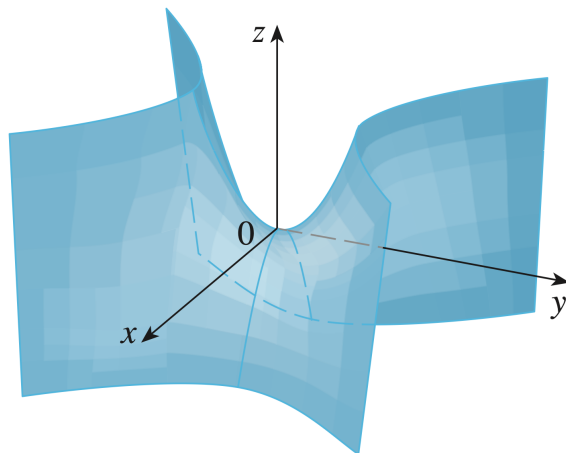


Remark. How can we use cross-sections to help us sketch graphs of functions of two variables?

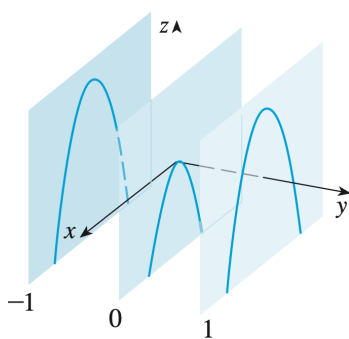
Example. Use traces to sketch the graph of the function $f(x, y) = 4x^2 + y^2$.



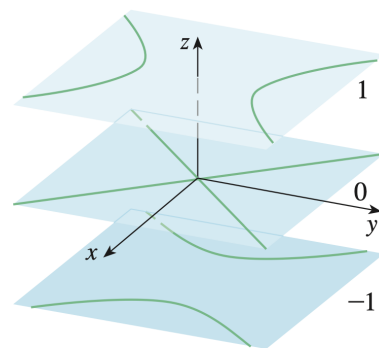
Example. Sketch the graph of $f(x, y) = y^2 - x^2$.



Traces in $x = k$



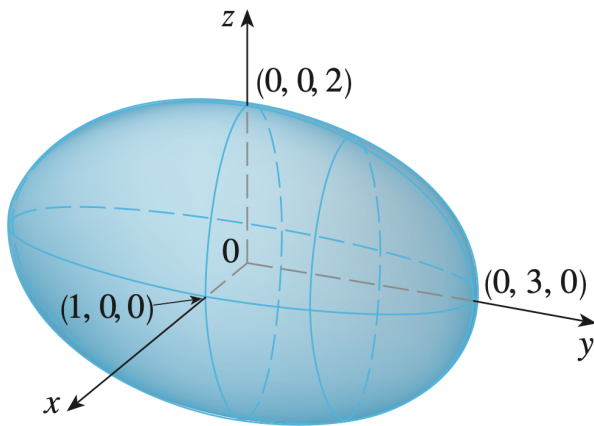
Traces in $y = k$



Traces in $z = k$

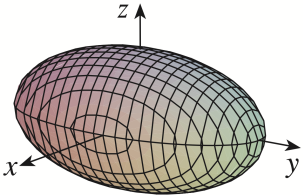
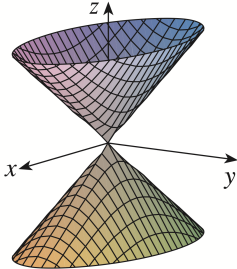
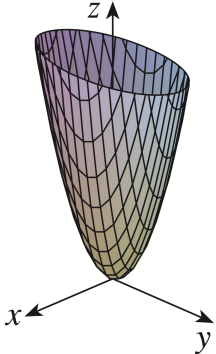
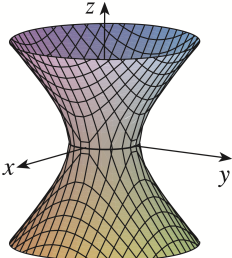
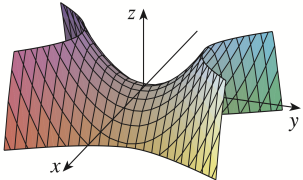
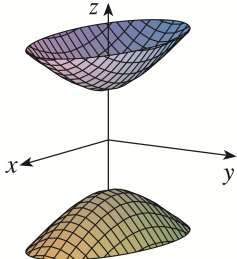
Definition. What is a quadric surface?

Example. Sketch the quadric surface with equation $x^2 + \frac{y^2}{9} + \frac{z^2}{4} = 1$.



Question. Is the ellipsoid $x^2 + \frac{y^2}{9} + \frac{z^2}{4} = 1$ the graph of a function?

Example. Below is a table of the six basic types of quadric surfaces in standard form.

Surface	Equation	Surface	Equation
			
			
			

Example. Classify the quadric surface $x^2 + 2z^2 - 6x - y + 10 = 0$.

