

## 14.2 Exercises

- Suppose that  $\lim_{(x,y) \rightarrow (3,1)} f(x,y) = 6$ . What can you say about the value of  $f(3,1)$ ? What if  $f$  is continuous?
- Explain why each function is continuous or discontinuous.
  - The outdoor temperature as a function of longitude, latitude, and time
  - Elevation (height above sea level) as a function of longitude, latitude, and time
  - The cost of a taxi ride as a function of distance traveled and time

3–4 ■ Use a table of numerical values of  $f(x,y)$  for  $(x,y)$  near the origin to make a conjecture about the value of the limit of  $f(x,y)$  as  $(x,y) \rightarrow (0,0)$ . Then explain why your guess is correct.

$$3. f(x,y) = \frac{x^2y^3 + x^3y^2 - 5}{2 - xy} \qquad 4. f(x,y) = \frac{2xy}{x^2 + 2y^2}$$

5–20 ■ Find the limit, if it exists, or show that the limit does not exist.

- $\lim_{(x,y) \rightarrow (5,-2)} (x^5 + 4x^3y - 5xy^2)$
- $\lim_{(x,y) \rightarrow (0,0)} xy \cos(x - 2y)$

- $\lim_{(x,y) \rightarrow (0,0)} \frac{x^2}{x^2 + y^2}$
- $\lim_{(x,y) \rightarrow (0,0)} \frac{x^2 + \sin^2 y}{2x^2 + y^2}$
- $\lim_{(x,y) \rightarrow (0,0)} \frac{xy \cos y}{3x^2 + y^2}$
- $\lim_{(x,y) \rightarrow (0,0)} \frac{6x^3y}{2x^4 + y^4}$
- $\lim_{(x,y) \rightarrow (0,0)} \frac{xy}{\sqrt{x^2 + y^2}}$
- $\lim_{(x,y) \rightarrow (0,0)} \frac{x^4 - y^4}{x^2 + y^2}$
- $\lim_{(x,y) \rightarrow (0,0)} \frac{2x^2y}{x^4 + y^2}$
- $\lim_{(x,y) \rightarrow (0,0)} \frac{x^2 \sin^2 y}{x^2 + 2y^2}$
- $\lim_{(x,y) \rightarrow (0,0)} \frac{x^2 + y^2}{\sqrt{x^2 + y^2} + 1} - 1$
- $\lim_{(x,y,z) \rightarrow (3,0,1)} e^{-xy} \sin(\pi z/2)$
- $\lim_{(x,y,z) \rightarrow (0,0,0)} \frac{x^2 + 2y^2 + 3z^2}{x^2 + y^2 + z^2}$
- $\lim_{(x,y,z) \rightarrow (0,0,0)} \frac{xy + yz^2 + xz^2}{x^2 + y^2 + z^4}$
- $\lim_{(x,y,z) \rightarrow (0,0,0)} \frac{xy + yz + zx}{x^2 + y^2 + z^2}$