

5–22 Find the limit, if it exists, or show that the limit does not exist.

5. $\lim_{(x,y) \rightarrow (1,2)} (5x^3 - x^2y^2)$

8. $\lim_{(x,y) \rightarrow (1,0)} \ln\left(\frac{1+y^2}{x^2+xy}\right)$

13. $\lim_{(x,y) \rightarrow (0,0)} \frac{xy}{\sqrt{x^2+y^2}}$

16. $\lim_{(x,y) \rightarrow (0,0)} \frac{x^2 \sin^2 y}{x^2 + 2y^2}$

25–26 Find $h(x, y) = g(f(x, y))$ and the set on which h is continuous.

25. $g(t) = t^2 + \sqrt{t}$, $f(x, y) = 2x + 3y - 6$

29–38 Determine the set of points at which the function is continuous.

29. $F(x, y) = \frac{\sin(xy)}{e^x - y^2}$

30. $F(x, y) = \frac{x - y}{1 + x^2 + y^2}$

31. $F(x, y) = \arctan(x + \sqrt{y})$

32. $F(x, y) = e^{x^2y} + \sqrt{x + y^2}$

39–41 Use polar coordinates to find the limit. [If (r, θ) are polar coordinates of the point (x, y) with $r \geq 0$, note that $r \rightarrow 0^+$ as $(x, y) \rightarrow (0, 0)$.]

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

40. $\lim_{(x,y) \rightarrow (0,0)} (x^2 + y^2) \ln(x^2 + y^2)$