

Section 13.2

1) $f(x, y) = 5xy$

a) Find $\lim_{(x,y) \rightarrow (1,3)} f(x, y) = \underline{\hspace{2cm}}$

b) Discuss continuity of $f(x, y)$.

2) $f(x, y) = e^{xy}$

a) Find $\lim_{(x,y) \rightarrow (1,-2)} f(x, y) = \underline{\hspace{2cm}}$

b) Discuss continuity of $f(x, y)$.

3) $f(x, y) = \frac{x+y}{7xy}$

a) Find $\lim_{(x,y) \rightarrow (1,9)} f(x, y) = \underline{\hspace{2cm}}$

b) Discuss continuity of $f(x, y)$.

4) $f(x, y) = \frac{x+y}{\sqrt{x+y}}$

a) Find $\lim_{(x,y) \rightarrow (1,4)} f(x, y) = \underline{\hspace{2cm}}$

b) Discuss continuity of $f(x, y)$.

5) $f(x, y) = \frac{x+y}{x-y}$

a) Find $\lim_{(x,y) \rightarrow (1,1)} f(x, y) = \underline{\hspace{2cm}}$

b) Discuss continuity of $f(x, y)$.

$$6) f(x, y) = \frac{8x + y}{x^2 + y}$$

a) Find $\lim_{(x,y) \rightarrow (0,0)} f(x, y)$ along the line $y = 0$.

b) Find $\lim_{(x,y) \rightarrow (0,0)} f(x, y)$ along the line $x = 0$

c) Find $\lim_{(x,y) \rightarrow (0,0)} f(x, y)$ along the line $y = x$

d) Does $\lim_{(x,y) \rightarrow (0,0)} f(x, y)$ exist?

$$7) f(x, y) = \frac{8xy}{x^2 + y^2}$$

a) Find $\lim_{(x,y) \rightarrow (0,0)} f(x, y)$ along the line $y = 0$.

b) Find $\lim_{(x,y) \rightarrow (0,0)} f(x, y)$ along the line $x = 0$

c) Find $\lim_{(x,y) \rightarrow (0,0)} f(x, y)$ along the line $y = x$

d) Does $\lim_{(x,y) \rightarrow (0,0)} f(x, y)$ exist?

$$8) f(x, y) = \frac{x}{x^2 + y^2}$$

Use polar coordinates to find the limit. $x = r \cos \theta$; $y = r \sin \theta$; $x^2 + y^2 = r^2$

Note: As $(x, y) \rightarrow (0, 0)$, $r = \sqrt{x^2 + y^2} \rightarrow 0$

a) Express $\frac{x}{x^2 + y^2}$ in terms of r and/or θ : $\frac{x}{x^2 + y^2} = \underline{\hspace{2cm}}$

b) Find $\lim_{(x,y) \rightarrow (0,0)} f(x, y) = \underline{\hspace{2cm}}$

9) $f(x, y) = \cos \sqrt{x^2 + y^2}$

Use polar coordinates to find the limit. $x = r \cos \theta$; $y = r \sin \theta$; $x^2 + y^2 = r^2$

Note: As $(x, y) \rightarrow (0, 0)$, $r = \sqrt{x^2 + y^2} \rightarrow 0$

a) Express $\cos \sqrt{x^2 + y^2}$ in terms of r and/or θ : $\cos \sqrt{x^2 + y^2} = \underline{\hspace{2cm}}$

b) Find $\lim_{(x,y) \rightarrow (0,0)} f(x, y) = \underline{\hspace{2cm}}$

10) $f(x, y) = x^2 + 5y$

a) Find $\lim_{\Delta x \rightarrow 0} \frac{f(x + \Delta x, y) - f(x, y)}{\Delta x} = \underline{\hspace{2cm}}$

b) Find $\lim_{\Delta y \rightarrow 0} \frac{f(x, y + \Delta y) - f(x, y)}{\Delta y} = \underline{\hspace{2cm}}$

11) $f(x, y) = 4x + 5y - 3xy$

a) Find $\lim_{\Delta x \rightarrow 0} \frac{f(x + \Delta x, y) - f(x, y)}{\Delta x} = \underline{\hspace{2cm}}$

b) Find $\lim_{\Delta y \rightarrow 0} \frac{f(x, y + \Delta y) - f(x, y)}{\Delta y} = \underline{\hspace{2cm}}$

12) $f(x, y) = x^2 + 6y^2$

a) Find $\lim_{\Delta x \rightarrow 0} \frac{f(x + \Delta x, y) - f(x, y)}{\Delta x} = \underline{\hspace{2cm}}$

b) Find $\lim_{\Delta y \rightarrow 0} \frac{f(x, y + \Delta y) - f(x, y)}{\Delta y} = \underline{\hspace{2cm}}$