

1. Find the domain and range of the function.

a. $y = x^2 + 1$

b. $y = -\sqrt{x - 2}$

c. $y = \frac{1}{x+2}$

2. Determine the domain and range of the piecewise function, and evaluate the function as indicated.

$$f(x) = \begin{cases} 3x + 3, & x < 1 \\ -x^2 - 3, & x \geq 1 \end{cases}$$

a. domain

b. range

c. $f(-2)$

d. $f(3)$

e. $f(t^2 + 5)$

3. Find the composition functions $(f \circ g)$ and $(g \circ f)$ and state the domain of each composition function.

$$f(x) = x^2 + 1, \quad g(x) = \sin x$$

4. Find the composition functions $(f \circ g)$ and $(g \circ f)$ and state the domain of each composition function.

$$f(x) = x^2 + 3, \quad g(x) = \frac{1}{x - 2}$$

5. Find the limit L , then use the $\varepsilon - \delta$ definition to prove that the limit is L .

$$\lim_{x \rightarrow 2} (2x - 3)$$

6. Find the limit.

a. $\lim_{x \rightarrow 2} (2x^3 - x + 5)$

b. $\lim_{x \rightarrow 2} \frac{x+4}{x^2+1}$

c. $\lim_{x \rightarrow -2} \cos \pi x$

7. Use the given information to evaluate the given limits.

$$\lim_{x \rightarrow c} f(x) = -3, \quad \lim_{x \rightarrow c} g(x) = 5$$

a. $\lim_{x \rightarrow c} [2f(x) + \sqrt{g(x)}]$

b. $\lim_{x \rightarrow c} [3f(x)\sqrt{g(x)}]$

8. Find the limit (if it exists).

$$\lim_{x \rightarrow -1} \frac{x^2 - x - 2}{x^2 - 1}$$

9. Find the limit (if it exists).

$$\lim_{x \rightarrow -1} \frac{x^2 - 9}{x^2 - 5x + 6}$$

10. Find the limit (if it exists).

$$\lim_{x \rightarrow 1} \frac{\sqrt{x+3} - 2}{x^2 - 1}$$

11. Determine the limit of the trigonometric function (if it exists).

$$\lim_{x \rightarrow 0} \frac{\sin 5x}{2x}$$

12. Determine the limit of the trigonometric function (if it exists).

$$\lim_{x \rightarrow 0} \frac{\tan^2 x}{2x}$$

13. Determine the limit of the trigonometric function (if it exists).

$$\lim_{x \rightarrow 0} \frac{3(1 - \cos x)^2}{x}$$

14. Find

$$\lim_{\Delta x \rightarrow 0} \frac{f(x+h) - f(x)}{h}, \quad \text{where } f(x) = x + 1$$

15. Find

$$\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}, \quad \text{where } f(x) = 2x^2 - 1$$

16. Use the Squeeze Theorem to find $\lim_{x \rightarrow 0} f(x)$.

$$f(x) = x^2 \sin \frac{3}{x}$$

17. Use the Squeeze Theorem to find $\lim_{x \rightarrow 0} f(x)$.

$$2 - 3x^2 \leq f(x) \leq 2 + 5x^2$$

18. Find the limit (if it exists).

$$\lim_{x \rightarrow 4^+} \frac{|x - 4|}{x - 4}$$

19. Find the limit (if it exists).

$$\lim_{x \rightarrow 0^+} f(x), \quad f(x) = \begin{cases} 2x^2 + 2x + 1, & x \leq 0 \\ x - 3, & x > 0 \end{cases}$$

20. Find the limit (if it exists).

$$\lim_{x \rightarrow 2} f(x), \quad f(x) = \begin{cases} 10 - x, & x \leq 2 \\ x^2 + 2x, & x > 2 \end{cases}$$