

Solve the inequality and sketch the solution on a coordinate line.

$$\cdot 3x - 2 < 8$$

$$\cdot 4 + 5x \leq 3x - 7$$

$$\cdot 3 \leq 4 - 2x < 7$$

$$\cdot \frac{x}{x-3} < 4$$

$$\cdot \frac{3x+1}{x-2} < 1$$

$$\cdot \frac{4}{2-x} \leq 1$$

$$\cdot \frac{1}{5}x + 6 \geq 14$$

$$\cdot 2x - 1 > 11x + 9$$

$$\cdot -2 \geq 3 - 8x \geq -11$$

$$\cdot \frac{x}{8-x} \geq -2$$

$$\cdot \frac{\frac{1}{2}x - 3}{4+x} > 1$$

$$\cdot \frac{3}{x-5} \leq 2$$

## Group B Science

1) If  $-3 > -5$  Multiply both sides by 4

2) solve  $\left| \frac{2x-1}{6} \right| < 3$

3) find domain and range if  $f(x) = \frac{\sqrt{2-x}}{5}$

4) evaluate  $\left[ -1 \frac{7}{2} \right]$

find the domain of the given function  $f$ .

$$\cdot f(x) = \sqrt{4x - 2}$$

$$\cdot f(x) = \frac{10}{\sqrt{1 - x}}$$

$$\cdot f(x) = \frac{2x - 5}{x(x - 3)}$$

$$\cdot f(x) = \frac{1}{x^2 - 10x + 25}$$

$$\cdot f(x) = \frac{x}{x^2 - x + 1}$$

$$\cdot f(x) = \sqrt{15 - 5x}$$

$$\cdot f(x) = \frac{2x}{\sqrt{3x - 1}}$$

$$\cdot f(x) = \frac{x}{x^2 - 1}$$

$$\cdot f(x) = \frac{x + 1}{x^2 - 4x - 12}$$

$$\cdot f(x) = \frac{x^2 - 9}{x^2 - 2x - 1}$$

**In Exercises 3–18, solve the inequality.**

**3.**  $|x| < 3$

**4.**  $|y| \geq 4.5$

**5.**  $|d + 9| > 3$

**6.**  $|h - 5| \leq 10$

**7.**  $|2s - 7| \geq -1$

**8.**  $|4c + 5| > 7$

**9.**  $|5p + 2| < -4$

**10.**  $|9 - 4n| < 5$

**11.**  $|6t - 7| - 8 \geq 3$

**12.**  $|3j - 1| + 6 > 0$

**13.**  $3|14 - m| > 18$

**14.**  $-4|6b - 8| \leq 12$

**15.**  $2|3w + 8| - 13 \leq -5$

**16.**  $-3|2 - 4u| + 5 < -13$

**17.**  $6|-f + 3| + 7 > 7$

**18.**  $\frac{2}{3}|4v + 6| - 2 \leq 10$

1)  $|3x - 9| - 10 = -4$

B. Algebraically determine whether the following functions are Even, Odd, or Neither

1.  $f(x) = x^3 - x^2 + 4x + 2$

2.  $f(x) = -x^2 + 10$

3.  $f(x) = x^3 + 4x$

4.  $f(x) = -x^3 + 5x - 2$

5.  $f(x) = \sqrt{x^4 - x^2} + 4$

6.  $f(x) = |x + 4|$

7.  $f(x) = |x| + 4$

8.  $f(x) = x^4 - 2x^2 + 4$

9.  $f(x) = \sqrt[3]{x}$

10.  $f(x) = x\sqrt{x^2 - 1}$

In Problems 23–38, for the given functions  $f$  and  $g$ , find:

(a)  $f \circ g$       (b)  $g \circ f$       (c)  $f \circ f$       (d)  $g \circ g$

23.  $f(x) = 2x + 3$ ;  $g(x) = 3x$

24.  $f(x) = -x$ ;  $g(x) = 2x - 4$

25.  $f(x) = 3x + 1$ ;  $g(x) = x^2$

26.  $f(x) = x + 1$ ;  $g(x) = x^2 + 4$

27.  $f(x) = x^2$ ;  $g(x) = x^2 + 4$

28.  $f(x) = x^2 + 1$ ;  $g(x) = 2x^2 + 3$

29.  $f(x) = \frac{3}{x-1}$ ;  $g(x) = \frac{2}{x}$

30.  $f(x) = \frac{1}{x+3}$ ;  $g(x) = -\frac{2}{x}$

31.  $f(x) = \frac{x}{x-1}$ ;  $g(x) = -\frac{4}{x}$

32.  $f(x) = \frac{x}{x+3}$ ;  $g(x) = \frac{2}{x}$

33.  $f(x) = \sqrt{x}$ ;  $g(x) = 2x + 3$

34.  $f(x) = \sqrt{x-2}$ ;  $g(x) = 1 - 2x$

35.  $f(x) = x^2 + 1$ ;  $g(x) = \sqrt{x-1}$

36.  $f(x) = x^2 + 4$ ;  $g(x) = \sqrt{x-2}$

37.  $f(x) = \frac{x-5}{x+1}$ ;  $g(x) = \frac{x+2}{x-3}$

38.  $f(x) = \frac{2x-1}{x-2}$ ;  $g(x) = \frac{x+4}{2x-5}$

## Now you try some!

1.  $\lim_{x \rightarrow c} (2x + 5)$
2.  $\lim_{t \rightarrow 6} 8(t - 5)(t - 7)$
3.  $\lim_{x \rightarrow 2} \frac{x+2}{x^2+5x+6}$

## Now you try some!

- a)  $\lim_{x \rightarrow 5} \frac{2x^2 - 7x - 15}{x - 5}$
- b)  $\lim_{x \rightarrow 1} \frac{x^3 - 1}{x - 1}$

## Now you try some!

1.  $\lim_{x \rightarrow 0} \frac{\sin 3x}{4x}$
2.  $\lim_{x \rightarrow 1} \frac{5x^4 - 4x^2 - 1}{10 - x - 9x^3}$
3.  $\lim_{x \rightarrow \infty} \frac{e^x}{x^3}$
4.  $\lim_{x \rightarrow -\infty} x * \ln x$
5.  $\lim_{x \rightarrow \infty} x^{\frac{1}{x}}$
6. Why does the  $\lim_{x \rightarrow -1} \frac{\sqrt{x+4}-3}{x+1}$  not equal  $1/2\sqrt{3}$ ?

In Problems 1–14, sketch the graph of the function to find the given limit, or state that it does not exist.

1.  $\lim_{x \rightarrow 2} (3x + 2)$

2.  $\lim_{x \rightarrow 2} (x^2 - 1)$

3.  $\lim_{x \rightarrow 0} \left(1 + \frac{1}{x}\right)$

4.  $\lim_{x \rightarrow 5} \sqrt{x - 1}$

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

6.  $\lim_{x \rightarrow 0} \frac{x^2 - 3x}{x}$

7.  $\lim_{x \rightarrow 3} \frac{|x - 3|}{x - 3}$

8.  $\lim_{x \rightarrow 0} \frac{|x| - x}{x}$

9.  $\lim_{x \rightarrow 0} \frac{x^3}{x}$

10.  $\lim_{x \rightarrow 1} \frac{x^4 - 1}{x^2 - 1}$

11.  $\lim_{x \rightarrow 0} f(x)$  where  $f(x) = \begin{cases} x + 3, & x < 0 \\ -x + 3, & x \geq 0 \end{cases}$

12.  $\lim_{x \rightarrow 2} f(x)$  where  $f(x) = \begin{cases} x, & x < 2 \\ x + 1, & x \geq 2 \end{cases}$

13.  $\lim_{x \rightarrow 2} f(x)$  where  $f(x) = \begin{cases} x^2 - 2x, & x < 2 \\ 1, & x = 2 \\ x^2 - 6x + 8, & x > 2 \end{cases}$

14.  $\lim_{x \rightarrow 0} f(x)$  where  $f(x) = \begin{cases} x^2, & x < 0 \\ 2, & x = 0 \\ \sqrt{x} - 1, & x > 0 \end{cases}$

In Exercises 23–40, find the limit.

$$23. \lim_{x \rightarrow 2} x^4$$

$$24. \lim_{x \rightarrow -2} x^3$$

$$25. \lim_{x \rightarrow -3} (3x + 2)$$

$$26. \lim_{x \rightarrow 0} (2x - 3)$$

$$27. \lim_{x \rightarrow 1} (1 - x^2)$$

$$28. \lim_{x \rightarrow 2} (-x^2 + x - 2)$$

$$29. \lim_{x \rightarrow 3} \sqrt{x + 1}$$

$$30. \lim_{x \rightarrow 4} \sqrt[3]{x + 4}$$

$$31. \lim_{x \rightarrow -3} \frac{2}{x + 2}$$

$$32. \lim_{x \rightarrow -2} \frac{3x + 1}{2 - x}$$

$$33. \lim_{x \rightarrow -2} \frac{x^2 - 1}{2x}$$

$$34. \lim_{x \rightarrow -1} \frac{4x - 5}{3 - x}$$

$$35. \lim_{x \rightarrow 7} \frac{5x}{x + 2}$$

$$36. \lim_{x \rightarrow 3} \frac{\sqrt{x + 1}}{x - 4}$$

$$37. \lim_{x \rightarrow 3} \frac{\sqrt{x + 1} - 1}{x}$$

$$38. \lim_{x \rightarrow 5} \frac{\sqrt{x + 4} - 2}{x}$$

$$39. \lim_{x \rightarrow 1} \frac{\frac{1}{x + 4} - \frac{1}{4}}{x}$$

$$40. \lim_{x \rightarrow 2} \frac{\frac{1}{x + 2} - \frac{1}{2}}{x}$$

In Exercises 41–58, find the limit (if it exists).

$$41. \lim_{x \rightarrow -1} \frac{x^2 - 1}{x + 1}$$

$$43. \lim_{x \rightarrow 2} \frac{x - 2}{x^2 - 4x + 4}$$

$$45. \lim_{t \rightarrow 5} \frac{t - 5}{t^2 - 25}$$

$$47. \lim_{x \rightarrow -2} \frac{x^3 + 8}{x + 2}$$

$$49. \lim_{x \rightarrow -2} \frac{|x + 2|}{x + 2}$$

$$51. \lim_{x \rightarrow 3} f(x), \text{ where } f(x) = \begin{cases} \frac{1}{3}x - 2, & x \leq 3 \\ -2x + 5, & x > 3 \end{cases}$$

$$52. \lim_{s \rightarrow 1} f(s), \text{ where } f(s) = \begin{cases} s, & s \leq 1 \\ 1 - s, & s > 1 \end{cases}$$

$$42. \lim_{x \rightarrow -1} \frac{2x^2 - x - 3}{x + 1}$$

$$44. \lim_{x \rightarrow 2} \frac{2 - x}{x^2 - 4}$$

$$46. \lim_{t \rightarrow 1} \frac{t^2 + t - 2}{t^2 - 1}$$

$$48. \lim_{x \rightarrow 1} \frac{x^3 - 1}{x - 1}$$

$$50. \lim_{x \rightarrow 2} \frac{|x - 2|}{x - 2}$$

$$53. \lim_{\Delta x \rightarrow 0} \frac{2(x + \Delta x) - 2x}{\Delta x}$$

$$54. \lim_{\Delta x \rightarrow 0} \frac{4(x + \Delta x) - 5 - (4x - 5)}{\Delta x}$$

$$55. \lim_{\Delta x \rightarrow 0} \frac{\sqrt{x + 2 + \Delta x} - \sqrt{x + 2}}{\Delta x}$$

$$56. \lim_{\Delta x \rightarrow 0} \frac{\sqrt{x + \Delta x} - \sqrt{x}}{\Delta x}$$

$$57. \lim_{\Delta t \rightarrow 0} \frac{(t + \Delta t)^2 - 5(t + \Delta t) - (t^2 - 5t)}{\Delta t}$$

$$58. \lim_{\Delta t \rightarrow 0} \frac{(t + \Delta t)^2 - 4(t + \Delta t) + 2 - (t^2 - 4t + 2)}{\Delta t}$$



1. Compute  $\lim_{x \rightarrow 0} \frac{\sin(5x)}{x} \Rightarrow$

2. Compute  $\lim_{x \rightarrow 0} \frac{\sin(7x)}{\sin(2x)} \Rightarrow$

3. Compute  $\lim_{x \rightarrow 0} \frac{\cot(4x)}{\csc(3x)} \Rightarrow$

4. Compute  $\lim_{x \rightarrow 0} \frac{\tan x}{x} \Rightarrow$

5. Compute  $\lim_{x \rightarrow \pi/4} \frac{\sin x - \cos x}{\cos(2x)} \Rightarrow$

6. For all  $x \geq 0$ ,  $4x - 9 \leq f(x) \leq x^2 - 4x + 7$ . Find  $\lim_{x \rightarrow 4} f(x)$ .  $\Rightarrow$

7. For all  $x$ ,  $2x \leq g(x) \leq x^4 - x^2 + 2$ . Find  $\lim_{x \rightarrow 1} g(x)$ .  $\Rightarrow$

8. Use the Squeeze Theorem to show that  $\lim_{x \rightarrow 0} x^4 \cos(2/x) = 0$ .

**25–34. Rational functions** Evaluate  $\lim_{x \rightarrow \infty} f(x)$  and  $\lim_{x \rightarrow -\infty} f(x)$  for the following rational functions. Then give the horizontal asymptote of  $f$  (if any).

25.  $f(x) = \frac{4x}{20x + 1}$

26.  $f(x) = \frac{3x^2 - 7}{x^2 + 5x}$

27.  $f(x) = \frac{6x^2 - 9x + 8}{3x^2 + 2}$

28.  $f(x) = \frac{4x^2 - 7}{8x^2 + 5x + 2}$

29.  $f(x) = \frac{3x^3 - 7}{x^4 + 5x^2}$

30.  $f(x) = \frac{x^4 + 7}{x^5 + x^2 - x}$

31.  $f(x) = \frac{2x + 1}{3x^4 - 2}$

32.  $f(x) = \frac{12x^8 - 3}{3x^8 - 2x^7}$

33.  $f(x) = \frac{40x^5 + x^2}{16x^4 - 2x}$

34.  $f(x) = \frac{-x^3 + 1}{2x + 8}$

**15–24. Infinite limits at infinity** Determine the following limits.

15.  $\lim_{x \rightarrow \infty} x^{12}$

16.  $\lim_{x \rightarrow -\infty} 3x^{11}$

17.  $\lim_{x \rightarrow \infty} x^{-6}$

18.  $\lim_{x \rightarrow -\infty} x^{-11}$

19.  $\lim_{x \rightarrow \infty} (3x^{12} - 9x^7)$

20.  $\lim_{x \rightarrow -\infty} (3x^7 + x^2)$

21.  $\lim_{x \rightarrow -\infty} (-3x^{16} + 2)$

22.  $\lim_{x \rightarrow -\infty} 2x^{-8}$

23.  $\lim_{x \rightarrow \infty} (-12x^{-5})$

24.  $\lim_{x \rightarrow -\infty} (2x^{-8} + 4x^3)$

**35–38. Algebraic functions** Evaluate  $\lim_{x \rightarrow \infty} f(x)$  and  $\lim_{x \rightarrow -\infty} f(x)$  for the following functions. Then give the horizontal asymptote(s) of  $f$  (if any).

35.  $f(x) = \frac{4x^3 + 1}{2x^3 + \sqrt{16x^6 + 1}}$

36.  $f(x) = \frac{\sqrt{x^2 + 1}}{2x + 1}$

37.  $f(x) = \frac{\sqrt[3]{x^6 + 8}}{4x^2 + \sqrt{3x^4 + 1}}$

38.  $f(x) = 4x(3x - \sqrt{9x^2 + 1})$

**9–14. Limits at infinity** Evaluate the following limits.

9.  $\lim_{x \rightarrow \infty} \left( 3 + \frac{10}{x^2} \right)$

10.  $\lim_{x \rightarrow \infty} \left( 5 + \frac{1}{x} + \frac{10}{x^2} \right)$

11.  $\lim_{\theta \rightarrow \infty} \frac{\cos \theta}{\theta^2}$

12.  $\lim_{x \rightarrow \infty} \frac{3 + 2x + 4x^2}{x^2}$

13.  $\lim_{x \rightarrow \infty} \frac{\cos x^5}{\sqrt{x}}$

14.  $\lim_{x \rightarrow -\infty} \left( 5 + \frac{100}{x} + \frac{\sin^4 x^3}{x^2} \right)$