

### Assignment 1-2

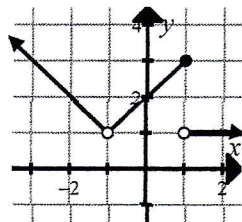
Find the indicated limits without using a calculator. **Show steps using correct limit symbolism!**

1.  $\lim_{x \rightarrow 1} \frac{x^2 - 1}{x - 1}$
2.  $\lim_{x \rightarrow -1} \frac{2x^2 - x - 3}{x + 1}$
3.  $\lim_{x \rightarrow -1} \frac{x^2 - 1}{x - 1}$
4.  $\lim_{x \rightarrow -1} \frac{x^3 + 1}{x + 1}$
5.  $\lim_{x \rightarrow -1} \frac{x}{x^2 + 1}$
6.  $\lim_{x \rightarrow 5} \frac{x - 5}{x^2 - 25}$
7.  $\lim_{x \rightarrow -5} \frac{x - 5}{x^2 - 25}$
8.  $\lim_{x \rightarrow 2} \frac{2 - x}{x^2 - 4}$
9.  $\lim_{x \rightarrow 3} \frac{x^2 - 9}{x^2 - 6x + 9}$
10.  $\lim_{x \rightarrow -2} \sqrt[3]{x^2 + 4}$
11.  $\lim_{x \rightarrow 0} \frac{x}{x - 1}$
12.  $\lim_{x \rightarrow 2} \frac{1}{x^2 - 4}$
13.  $\lim_{x \rightarrow 1} \frac{x}{x^2 + 1}$
14.  $\lim_{x \rightarrow 4} \frac{\sqrt{x} - 2}{x - 4}$
15.  $\lim_{x \rightarrow 3} \frac{x - 3}{\sqrt{x + 1} - 2}$
16.  $\lim_{x \rightarrow 0} \frac{|x|}{x}$
17.  $\lim_{x \rightarrow 0} \frac{|x|}{x}$
18.  $\lim_{x \rightarrow \frac{\pi}{2}} \sin x$
19.  $\lim_{x \rightarrow \pi} \sec x$
20.  $\lim_{x \rightarrow \frac{\pi}{2}} \cos(3x)$
21.  $\lim_{x \rightarrow 5} \csc \frac{\pi x}{6}$
22.  $\lim_{x \rightarrow 3^+} \lfloor x - 1 \rfloor$
23.  $\lim_{x \rightarrow 3^-} \lfloor x - 1 \rfloor$
24.  $\lim_{x \rightarrow 3} \lfloor x - 1 \rfloor$
25.  $\lim_{x \rightarrow 2} \lfloor x + 6 \rfloor$
26.  $\lim_{x \rightarrow 3} \lfloor \frac{x}{2} \rfloor$
27.  $\lim_{x \rightarrow 5} \lfloor 2x - 3 \rfloor$
28.  $\lim_{x \rightarrow 5} \frac{\frac{1}{x} - \frac{1}{5}}{x - 5}$
29.  $\lim_{x \rightarrow 3} \begin{cases} \frac{1}{2}x + 1, & x \leq 3 \\ \frac{12 - 2x}{3}, & x > 3 \end{cases}$
30.  $\lim_{x \rightarrow 1} \begin{cases} x^2 + 1, & x < 1 \\ x^3 + 1, & x \geq 1 \end{cases}$
31.  $\lim_{x \rightarrow 2} \begin{cases} x - 2, & x \leq 0 \\ x + 2, & x > 0 \end{cases}$

Use a calculator to find these limits.

32. (a)  $\lim_{x \rightarrow 1} \frac{\sin x}{6x}$
- (b)  $\lim_{x \rightarrow 0} \frac{\sin x}{6x}$
33.  $\lim_{x \rightarrow -2} \frac{x^3 + 2x^2 - x - 2}{x^3 + 2x^2 + x + 2}$
34.  $\lim_{x \rightarrow 2} \frac{|2 - x|}{25x - 50}$

35. a.  $h(-1)$
- b.  $h(1)$
- c.  $\lim_{x \rightarrow -1} h(x)$
- d.  $\lim_{x \rightarrow 1^-} h(x)$
- e.  $\lim_{x \rightarrow 1^+} h(x)$
- f.  $\lim_{x \rightarrow 1} h(x)$
- g. removable discontinuities
- h. nonremovable discontinuities



$$h(x) = \begin{cases} -x, & x < -1 \\ x + 2, & -1 < x \leq 1 \\ 1, & x > 1 \end{cases}$$

Find all discontinuities for these functions and classify them as removable or nonremovable. Do not use a calculator.

36.  $f(x) = \frac{2x - 3}{x + 1}$
37.  $f(x) = 2x - 3$
38.  $f(x) = \frac{1}{x^2 - 9}$
39.  $f(x) = \frac{x}{x^2 + x}$
40.  $f(x) = \frac{x^2 - 9}{x + 3}$
41.  $f(x) = \begin{cases} x^2, & x \leq 0 \\ x, & x > 0 \end{cases}$
42.  $f(x) = \begin{cases} x - 3, & x \leq 1 \\ x, & x > 1 \end{cases}$
43.  $f(x) = \begin{cases} 2x - 5, & x > 3 \\ x^2 - 8, & x < 3 \end{cases}$
44.  $f(x) = \lfloor x - 1 \rfloor$
45.  $f(x) = \lfloor \frac{x}{2} \rfloor$

Use a calculator to find all discontinuities for these functions and classify them as removable or nonremovable.

46.  $f(x) = \frac{10x}{6x^3 - 31x^2 + 23x + 20}$

47.  $f(x) = \frac{x}{x^3 + 4x}$

48.  $f(x) = \left\lfloor \frac{x}{4} \right\rfloor$

49. If the function  $f(x) = \begin{cases} x^3, & x \leq 2 \\ ax^2, & x > 2 \end{cases}$  is continuous, find the value of  $a$ .

50. Find the values of  $a$  and  $b$  so that  $f(x) = \begin{cases} x-1, & x \leq -1 \\ ax+b, & -1 < x < 1 \\ 2x+1, & x \geq 1 \end{cases}$  is continuous.

Determine whether the Intermediate Value Theorem would guarantee a  $c$ -value on the given interval.

51.  $f(x) = x^2 + x - 1$ ,  $f(c) = 11$ ,  $[0, 5]$

52.  $f(x) = \frac{x}{x-1}$ ,  $f(c) = 1$ ,  $[0, 2]$

53.  $f(x) = |x|$ ,  $f(c) = 3$ ,  $[-4, 1]$

54.  $f(x) = \begin{cases} x, & x \leq 1 \\ 3, & x > 1 \end{cases}$ ,  $f(c) = 2$ ,  $[0, 4]$

55.  $f(x) = \frac{x^2 + x}{x-1}$ ,  $f(c) = 6$ ,  $\left[\frac{5}{2}, 4\right]$

56. Find the  $c$ -value in Problem 51.

57. Find the  $c$ -value in Problem 53.

58. Find the  $c$ -value in Problem 55.

59. Find an equation of the line which intersects the graph of  $f(x) = \begin{cases} x^2 + 1, & x < 1 \\ x^3 + 1, & x \geq 1 \end{cases}$  when  $x = -2$  and again when  $x = 2$ .

60. Use the parent graph of  $y = \sqrt{x}$  to graph the following.

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

Use the graph of  $y = f(x)$  to draw **accurate** graphs of the following.

61.  $y = -f(x)$     62.  $y = |f(x)|$     63.  $y = f(|x|)$

64.  $y = f(x) - 1$     65.  $y = \frac{1}{2}f(x)$     66.  $y = f\left(\frac{1}{2}x\right)$

