

Evaluate each limit algebraically.

1) $\lim_{x \rightarrow -2} \frac{x^3 - 4x}{x - 2}$

2) $\lim_{x \rightarrow -4} \frac{x^2 - 16}{x^2 + 5x + 4}$

3) $\lim_{x \rightarrow -\infty} \frac{4x - 5x^3}{x^2 + 1}$

4) $\lim_{x \rightarrow 0} \frac{2x^3 + 5x^2}{x^3 - 3x^2}$

5) $\lim_{x \rightarrow \infty} \frac{\sqrt{6x^2 + 2x - 1}}{5x + 3}$

6) $\lim_{x \rightarrow \infty} \frac{x^2 + 2x}{e^{x^2}}$

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

8) $\lim_{x \rightarrow 16} \frac{\sqrt{x} - 4}{x - 16}$

9) $\lim_{x \rightarrow \infty} \frac{8x - 2}{5 - 4x}$

10) $\lim_{x \rightarrow 0} \frac{\sqrt{x+6} - \sqrt{6}}{x}$

11) $\lim_{x \rightarrow \infty} \frac{(2-x)(4x+4)}{(2x+1)(2+3x)}$

12) $\lim_{x \rightarrow 0} \frac{\frac{1}{x-2} + \frac{1}{2}}{x}$

13) $\lim_{\theta \rightarrow 0} \frac{\sin a\theta}{b\theta}$

14) $\lim_{x \rightarrow 0} \frac{\cos x - \cos^2 x}{x}$

15) $\lim_{h \rightarrow 4} \frac{(2+h)^2 - 9h}{h-4}$

16) $\lim_{x \rightarrow \infty} \frac{6x^2 - 9}{x^3 - 12x + 3}$

17) $\lim_{x \rightarrow 2^-} \frac{x+5}{x-2}$

18) $\lim_{x \rightarrow 2^+} \frac{x+5}{x-2}$

19) $\lim_{x \rightarrow 2^-} [x]$

20) $\lim_{x \rightarrow 2^+} [x]$

21) $\lim_{x \rightarrow -2^-} [x]$

22) $\lim_{x \rightarrow -2^+} [x]$

23) When $g(x) = \begin{cases} 4x^2 & x \leq 0 \\ 2x+1 & \\ \frac{1}{x} & x > 0 \end{cases}$, find each limit:

$\lim_{x \rightarrow \infty} g(x)$
 $\lim_{x \rightarrow -\infty} g(x)$
 $\lim_{x \rightarrow 0^-} g(x)$
 $\lim_{x \rightarrow 0^+} g(x)$

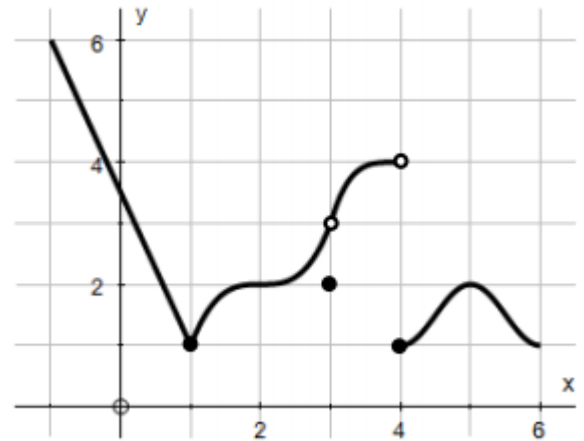
24) Find all horizontal and vertical asymptotes: $f(x) = \frac{1-x}{2x^2 - 5x - 3}$

25) If $\lim_{x \rightarrow 2} f(x) = 6$ and $\lim_{x \rightarrow 2} g(x) = -2$, evaluate the following limits:

a) $\lim_{x \rightarrow 2} f(x) + g(x)$ b) $\lim_{x \rightarrow 2} f(x) - g(x)$ c) $\lim_{x \rightarrow 2} f(x) \cdot g(x)$ d) $\lim_{x \rightarrow 2} g(x) - 2f(x) + 3$

26) Evaluate each of the following limits. If they do not exist, explain why.

a) $\lim_{x \rightarrow 1} f(x)$ b) $\lim_{x \rightarrow 3^-} f(x)$
 c) $\lim_{x \rightarrow 3^+} f(x)$ d) $\lim_{x \rightarrow 3} f(x)$
 e) $\lim_{x \rightarrow 4^+} f(x)$ f) $\lim_{x \rightarrow 4^-} f(x)$
 g) $\lim_{x \rightarrow 4} f(x)$ h) $f(4)$



i) Using the definition of continuity, explain why f is discontinuous at $x = 4$

27) When $f(x) = \begin{cases} \sqrt{-x} & x < 0 \\ 3 - x & 0 \leq x < 3 \\ (x - 3)^2 & x > 3 \end{cases}$, find

a) $\lim_{x \rightarrow 0^-} f(x)$ b) $\lim_{x \rightarrow 0^+} f(x)$
 c) $\lim_{x \rightarrow 0} f(x)$ d) $f(0)$
 e) $\lim_{x \rightarrow 3^+} f(x)$ f) $\lim_{x \rightarrow 3^-} f(x)$
 g) $\lim_{x \rightarrow 3} f(x)$ h) $f(3)$

28) Use the definition of continuity to determine if g is continuous at $x = 1$ when $g(x) = \begin{cases} 2x - 1 & x \leq 1 \\ -3x + 1 & x > 1 \end{cases}$

29) Find the value of a that would make each function continuous.

a) $g(x) = \begin{cases} x^2 + ax & x \leq 5 \\ 5\sin\left(\frac{\pi x}{2}\right) & x > 5 \end{cases}$ b) $g(x) = \begin{cases} \frac{x^2 - 2x - 3}{x - 3} & x < 3 \\ ax - 2 & x \geq 3 \end{cases}$

30) The function $f(x)$ is a continuous function on the interval $[1, 8]$ with the values given below. Is there a value x , when $f(x) = 5$? Explain your answer.

x	1	5	8
$f(x)$	3	9	7