

## Practice 1. Limits

Find the limit.

1)  $\lim_{x \rightarrow 2} (x^2 + 8x - 2)$

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

Find the limit, if it exists.

3)  $\lim_{x \rightarrow 12} \frac{1}{x - 12}$

4)  $\lim_{x \rightarrow 0} \frac{x^3 - 6x + 8}{x - 2}$

5)  $\lim_{x \rightarrow 6} \frac{x + 6}{(x - 6)^2}$

6)  $\lim_{h \rightarrow 0} \frac{2}{\sqrt{3h+4} + 2}$

7)  $\lim_{x \rightarrow 0} \frac{\sqrt{1+x} - 1}{x}$

8)  $\lim_{x \rightarrow 0} \frac{x^3 + 12x^2 - 5x}{5x}$

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

10)  $\lim_{x \rightarrow 5} \frac{x^2 - 25}{x^2 - 6x + 5}$

Find the limit.

11)  $\lim_{x \rightarrow 0} (4 \sin x - 1)$

12)  $\lim_{x \rightarrow \pi} \sqrt{x+1} \cos(x + \pi)$

$$13) \lim_{x \rightarrow 0} \sqrt{15 + \cos^2 x}$$

Provide an appropriate response.

$$14) \text{ Let } \lim_{x \rightarrow 6} f(x) = -9 \text{ and } \lim_{x \rightarrow 6} g(x) = 6. \text{ Find } \lim_{x \rightarrow 6} [f(x) - g(x)].$$

$$15) \text{ Let } \lim_{x \rightarrow -5} f(x) = 9 \text{ and } \lim_{x \rightarrow -5} g(x) = 2. \text{ Find } \lim_{x \rightarrow -5} [f(x) \cdot g(x)].$$

$$16) \text{ Let } \lim_{x \rightarrow 9} f(x) = 6 \text{ and } \lim_{x \rightarrow 9} g(x) = -9. \text{ Find } \lim_{x \rightarrow 9} \left[ \frac{-4f(x) - 3g(x)}{2 + g(x)} \right].$$

Because of their connection with secant lines, tangents, and instantaneous rates, limits of the form

$\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$  occur frequently in calculus. Evaluate this limit for the given value of  $x$  and function  $f$ .

$$17) f(x) = 4x^2, x = 8$$

Provide an appropriate response.

$$18) \text{ It can be shown that the inequalities } -x \leq x \cos\left(\frac{1}{x}\right) \leq x \text{ hold for all values of } x \geq 0.$$

$$\text{Find } \lim_{x \rightarrow 0} x \cos\left(\frac{1}{x}\right) \text{ if it exists.}$$

$$19) \text{ The inequality } 1 - \frac{x^2}{2} < \frac{\sin x}{x} < 1 \text{ holds when } x \text{ is measured in radians and } |x| < 1.$$

$$\text{Find } \lim_{x \rightarrow 0} \frac{\sin x}{x} \text{ if it exists.}$$

$$20) \text{ If } x^3 \leq f(x) \leq x \text{ for } x \text{ in } [-1, 1], \text{ find } \lim_{x \rightarrow 0} f(x) \text{ if it exists.}$$

Find the limit.

$$21) \text{ If } \lim_{x \rightarrow 3} \frac{f(x) - 1}{x - 1} = 2, \text{ find } \lim_{x \rightarrow 3} f(x).$$

$$22) \text{ If } \lim_{x \rightarrow 2} \frac{f(x)}{x} = 3, \text{ find } \lim_{x \rightarrow 2} f(x).$$

Use a CAS to plot the function near the point  $x_0$  being approached. From your plot guess the value of the limit.

$$23) \lim_{x \rightarrow 64} \frac{\sqrt{x} - 8}{x - 64}$$

$$24) \lim_{x \rightarrow 1} \frac{1 - \sqrt{x}}{1 - x}$$

$$25) \lim_{x \rightarrow 0} \frac{\sqrt{3 + 3x} - \sqrt{3}}{x}$$

Find the limit.

$$26) \lim_{x \rightarrow \infty} \frac{1}{x} - 4$$

$$27) \lim_{x \rightarrow -\infty} \frac{8}{8 - (6/x^2)}$$

$$28) \lim_{x \rightarrow \infty} \frac{x^2 - 8x + 19}{x^3 + 3x^2 + 18}$$

$$29) \lim_{x \rightarrow -\infty} \frac{-11x^2 + 2x + 15}{-10x^2 - 2x + 18}$$

$$30) \lim_{x \rightarrow \infty} \frac{2x + 1}{12x - 7}$$

$$31) \lim_{x \rightarrow \infty} \frac{7x^3 - 6x^2 + 3x}{-x^3 - 2x + 7}$$

Divide numerator and denominator by the highest power of x in the denominator to find the limit.

$$32) \lim_{x \rightarrow \infty} \sqrt{\frac{25x^2}{2 + 36x^2}}$$

$$33) \lim_{x \rightarrow \infty} \sqrt{\frac{16x^2 + x - 3}{(x - 9)(x + 1)}}$$

$$34) \lim_{x \rightarrow \infty} \frac{5\sqrt{x} + x^{-1}}{5x + 5}$$

$$35) \lim_{x \rightarrow \infty} \frac{4x^{-1} - 3x^{-3}}{4x^{-2} + x^{-5}}$$

$$36) \lim_{x \rightarrow \infty} \frac{\sqrt[3]{x} + 2x - 3}{-5x + x^{2/3} + 3}$$

$$37) \lim_{t \rightarrow \infty} \frac{\sqrt{49t^2 - 343}}{t - 7}$$

$$38) \lim_{t \rightarrow \infty} \frac{\sqrt{36t^2 - 216}}{t - 6}$$

$$39) \lim_{x \rightarrow \infty} \frac{5x + 6}{\sqrt{6x^2 + 1}}$$

Find the limit.

$$40) \lim_{x \rightarrow 2^-} \frac{x^2 - 5x + 6}{x^3 - 4x}$$

Answer Key

Testname: CALC1PRACTICE\_1

- 1) 18
- 2) 1
- 3) Does not exist
- 4) -4
- 5) Does not exist
- 6)  $\frac{1}{2}$
- 7)  $\frac{1}{2}$
- 8) -1
- 9) 4
- 10)  $\frac{5}{2}$
- 11) 0
- 12)  $\sqrt{1 - \pi}$
- 13) 4
- 14) -15
- 15) 18
- 16)  $-\frac{3}{7}$
- 17) 64
- 18) 0
- 19) 1
- 20) 0
- 21) 5
- 22) 6
- 23)  $\frac{1}{16}$
- 24)  $\frac{1}{2}$
- 25)  $\frac{\sqrt{3}}{2}$
- 26) -4
- 27) 1
- 28) 0
- 29)  $\frac{11}{10}$
- 30)  $\frac{1}{6}$
- 31) -7
- 32)  $\frac{5}{6}$
- 33) 4
- 34) 0
- 35)  $\infty$
- 36)  $-\frac{2}{5}$
- 37) 7
- 38) 6

Answer Key

Testname: CALC1PRACTICE\_1

39)  $\frac{5}{\sqrt{6}}$

40)  $-\frac{1}{8}$