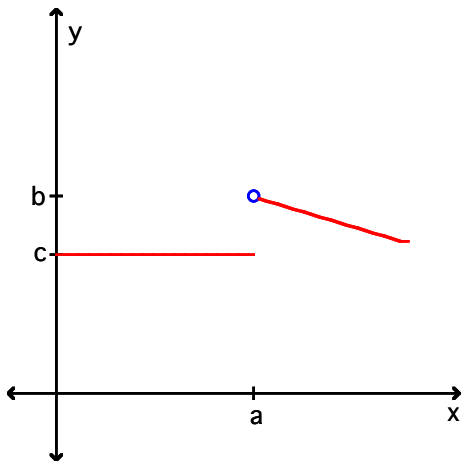


SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Find $\lim_{x \rightarrow a} f(x)$ if it exists.

1)



Find the indicated limit if exists.

2) $\lim_{x \rightarrow 8} \frac{5x - 2}{x + 8}$

3) $\lim_{x \rightarrow 0} \frac{x(x^2 - 36)}{x^2}$

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

Find $\lim_{x \rightarrow +\infty} f(x)$ and $\lim_{x \rightarrow -\infty} f(x)$. If the limiting value is infinite, indicate whether it is $+\infty$ or $-\infty$.

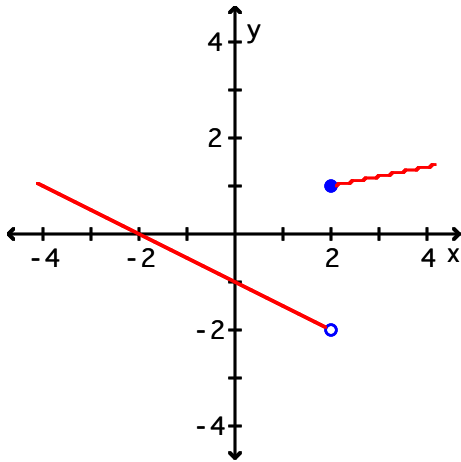
5) $f(x) = \frac{6 - 5x^3}{3x^3 - 8x - 5}$

6) $f(x) = \frac{9 - 5x^3}{x - 5}$

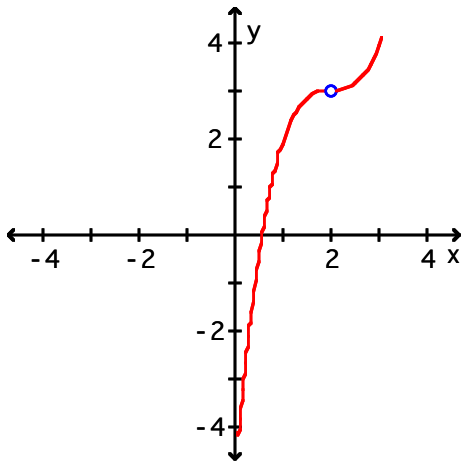
Find the one-sided limits $\lim_{x \rightarrow 2^-} f(x)$ and $\lim_{x \rightarrow 2^+} f(x)$ from the given graph of f and determine whether

$\lim_{x \rightarrow 2} f(x)$ exists.

7)



8)



Find the indicated one-sided limit. If the limiting value is infinite, indicate whether it is $+\infty$ or $-\infty$.

9) $\lim_{x \rightarrow 6^-} \frac{x+9}{x+6}$

10) $\lim_{x \rightarrow -5^-} f(x)$ and $\lim_{x \rightarrow -5^+} f(x)$ where $f(x) = \begin{cases} \frac{1}{x-5} & \text{if } x < -5 \\ x^2 + 2x & \text{if } x \geq -5 \end{cases}$

Decide if the given function is continuous at the specified value of x .

11) $f(x) = \begin{cases} x+4 & \text{if } x \leq 1 \\ 1 & \text{if } x > 1 \end{cases}$ at $x = 1$

List all the values of x for which the given function is not continuous.

$$12) f(x) = \begin{cases} 5x+4 & \text{if } x < 0 \\ x^2+x & \text{if } x \geq 0 \end{cases}$$

Compute the derivative of the given function using the limit definition and find the slope of the line that is tangent to its graph for the specified value of the independent variable.

$$13) f(x) = 9x+7; x = -1$$

$$14) f(x) = x^2 - 3; x = -2$$

$$15) g(t) = \frac{4}{t}; t = -\frac{1}{4}$$

Find the rate of change $\frac{dy}{dx}$ where $x = x_0$.

$$16) y = x^2 + 5x; x_0 = -6$$

Follow the instruction in the problem.

17) Find the average rate of change of the function $f(x) = x(3-2x)$ with respect to x as x changes from $x=1$ to $x=3$.

Find the instantaneous rate of change of $f(x)$ at $x=1$.

Differentiate the given function.

$$18) y = 5x^4 - 2x^3 - 2x - 9$$

$$19) f(u) = 0.05u^5 - 1.43u^4 - 4u + 7.9$$

$$20) y = \frac{4}{x} - \frac{3}{x^2} + \frac{4}{3x^3}$$

Find the equation of the line that is tangent to the graph of the given function at the specified point.

$$21) y = -3x^3 - \sqrt{x} + \frac{2}{x}; (1, -2)$$

Find the rate of change of the given function $f(x)$ with respect to x for the prescribed value $x = c$.

$$22) f(x) = \sqrt{x} - 4x; x = 25$$

Solve the problem.

23) The gross annual earnings of a certain company were $A(t) = 0.3t^2 + 12t + 20$ thousand dollars t years after its formation in 2008. At what percentage rate were the gross annual earnings growing with respect to time in 2012?

24) Records indicate that x years after 2008, the average property tax on a three bedroom home in a certain community was $T(x) = 20x^2 + 60x + 600$ dollars. At what rate was the property tax increasing with respect to time in 2008?

25) It is estimated that t years from now, the circulation of a local newspaper will be $C(t) = 80t^2 + 360t + 3000$. At what rate will the circulation be changing with respect to time 5 years from now? Will the circulation be increasing or decreasing at that time?

Differentiate the given function.

26) $f(x) = (x - 5)(3 - 4x)$

27) $y = \frac{x + 9}{x - 7}$

28) $f(t) = \frac{t}{t^2 + 6}$

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

Find an equation for the tangent line to the given curve at the point where $x = x_0$.

30) $y = \frac{x + 5}{2 - 3x}$; $x_0 = 0$

Find the rate of change $\frac{dy}{dx}$ for the prescribed value of x_0 .

31) $y = (x^2 + 3)(-1 - 2x^3)$; $x_0 = -1$

Find the second derivative of the given function. In each case, use the appropriate notation for the second derivative and simplify your answer. (Don't forget to simplify the first derivative as much as possible before computing the second derivative.)

32) $f(x) = \frac{2}{5}x^5 - 4x^3 - 3x^2 - 6x + 3$

33) $y = \frac{3}{4x} - \sqrt{2x} + \sqrt{2x} - \frac{1}{12\sqrt{x}}$

34) $y = (x^3 - 4x + 4)(3x + 5)$

Answer Key

Testname: EXAM1_REVIEW_TESTGEN

- 1) The limit fails to exist.
- 2) $\frac{19}{8}$
- 3) The limit fails to exist.
- 4) 8
- 5) $\lim_{x \rightarrow +\infty} f(x) = -\frac{5}{3}$; $\lim_{x \rightarrow -\infty} f(x) = -\frac{5}{3}$
- 6) $\lim_{x \rightarrow +\infty} f(x) = -\infty$; $\lim_{x \rightarrow -\infty} f(x) = -\infty$
- 7) -2; 1; does not exist
- 8) 3; 3; exists and equals 3
- 9) $\frac{5}{4}$
- 10) $\lim_{x \rightarrow -5^-} f(x) = -\frac{1}{10}$;
 $\lim_{x \rightarrow -5^+} f(x) = 15$
- 11) No; $\lim_{x \rightarrow 1} \neq f(1)$
- 12) $x = 0$
- 13) $f'(x) = 9$; $m = 9$
- 14) $f'(x) = 2x$, $m = -4$
- 15) $g'(t) = -\frac{4}{t^2}$; $m = -64$
- 16) $\frac{dy}{dx} = -7$
- 17)
- 18) $20x^3 - 6x^2 - 2$
- 19) $0.25u^4 - 5.72u^3 - 4$
- 20) $-\frac{4}{x^2} + \frac{6}{x^3} - \frac{4}{x^4}$
- 21) $y = -\frac{23}{2}x + \frac{19}{2}$
- 22) $f'(25) = -\frac{39}{10}$
- 23) 19.78% per year
- 24) \$60 per year
- 25) increasing at a rate of 1160 newspapers per year
- 26) $-8x + 23$
- 27) $\frac{-16}{(x-7)^2}$
- 28) $\frac{-t^2 + 6}{(t^2 + 6)^2}$
- 29) $\frac{-7x^2 - 4x + 11}{(2x^2 + 3x + 4)^2}$
- 30) $y = \frac{17}{4}x + \frac{5}{2}$
- 31) -26
- 32) $f''(x) = 8x^3 - 24x - 6$
- 33) $\frac{d^2y}{dx^2} = \frac{3}{2x^3} + \frac{\sqrt{2}}{4x^{3/2}} - \frac{1}{16x^{5/2}}$
- 34) $\frac{d^2y}{dx^2} = 36x^2 + 30x - 24$