Name_____

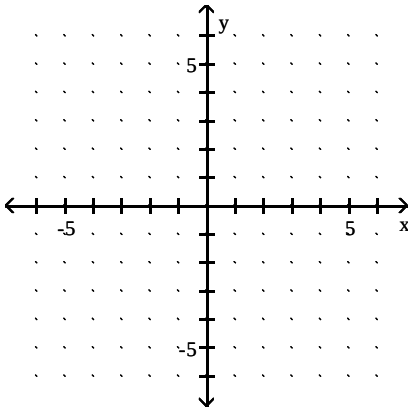
Find the indicated limit.

1) $\lim_{x \to 7} \frac{x^2 + 3x - 70}{x^2 - 49}$ 1) _____

2) $\lim_{x \to 0} \frac{x^4 + 4x^3 - 21x^2}{x^2}$ 2) _____

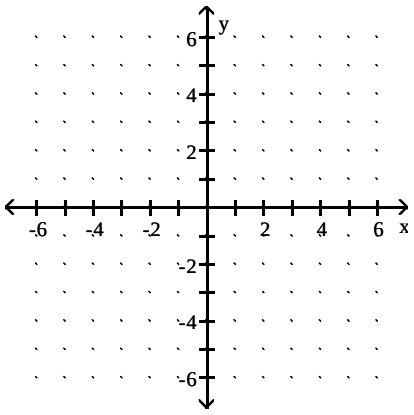
Graph the function and find the indicated limit.

3) Graph the function $f(x) = \frac{5|x|}{x}$ and find $\lim_{x \to 0^-} f(x)$. 3) _____



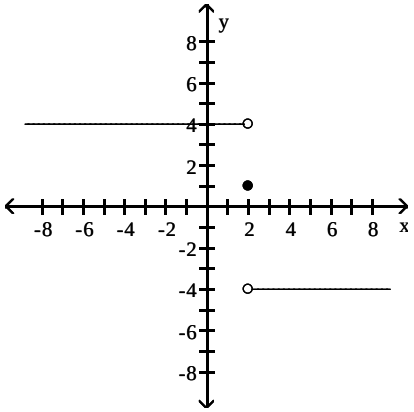
4) Graph the function f(x) and then find $\lim_{x \to 1} f(x)$ or state that it does not exist. 4) _____

$$f(x) = \begin{cases} -2 & \text{for } x \geq 1 \\ -4 - x & \text{for } x < 1 \end{cases}$$

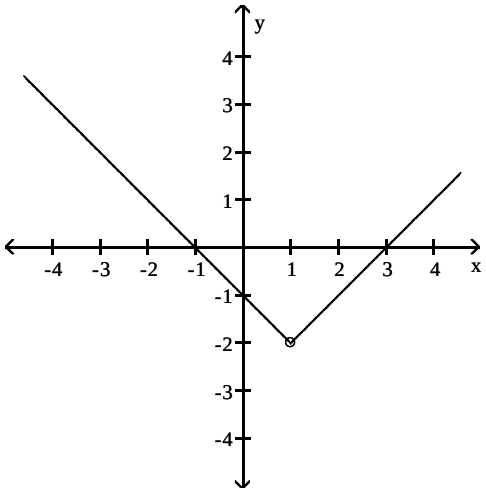


Use the graph to evaluate the indicated limit or function value or state that it does not exist.

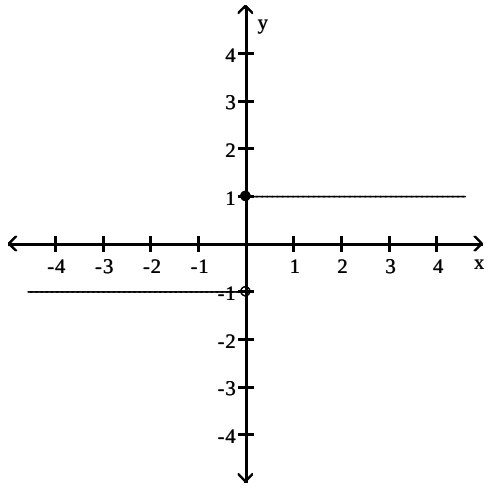
5) Find $\lim_{x \to 2^-} f(x)$ and $\lim_{x \to 2^+} f(x)$. 5) _____



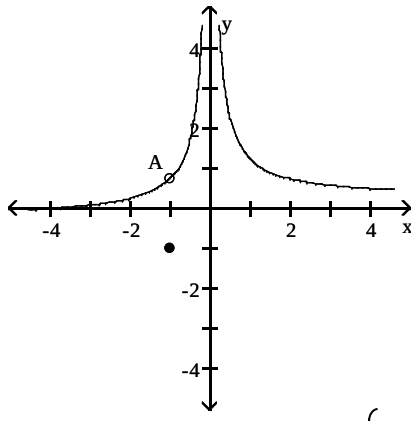
6) Find $\lim_{x \to 1} f(x)$ and f(1). 6) _____



7) Find $\lim_{x \to 0} f(x)$ and f(0). 7) _____



8) Find $\lim_{x \to -1} f(x)$ and f(–1). 8) _____



A is the point $\left(-1, \frac{3}{4}\right)$

Find the limit or state that it does not exist.

9) $\lim_{x \to 5^-} \frac{x^2 - 25}{|x - 5|}$ 9) _____

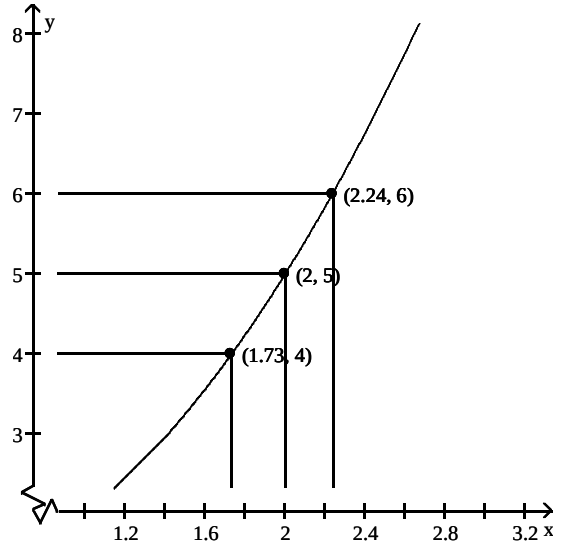
10) $\lim_{x \to 10} \frac{x^2 - 100}{|x - 10|}$ 10) _____

Let L be the value of $\lim_{x \to x_0} f(x)$**. Use graphical methods, and the additional information provided, to find a** $\delta > 0$ **so that if** $0 < |x - x_0| < \delta$**, then** $|f(x) - L| < \varepsilon$**.**

11) Let $f(x) = 3x + 4$, $x_0 = 2$, $L = 10$, and $\varepsilon = 0.2$ 11) _____

Use the graph to determine how close x must be to x_0 in order that f(x) is within ε of L. Your answer should be of the form "If x is within ___ of ___, then f(x) is within ____ of ___ ."

12) 12) _____



$f(x) = x^2 + 1$
$x_0 = 2$
$L = 5$
$\varepsilon = 1$

Give the appropriate ε–δ definition of the statement.

13) $\lim_{x \to x_0} f(x) = L$ 13) _____

Find the limit.

14) Let $\lim_{x \to -6} f(x) = -1$ and $\lim_{x \to -6} g(x) = -5$. 14) _____

Find $\lim_{x \to -6} \dfrac{7f(x) - 10g(x)}{g(x) - 3}$.

15) Let $\lim_{x \to 5} f(x) = 7$ and $\lim_{x \to 5} g(x) = 8$. 15) _____

Find $\lim_{x \to 5} [f(x) \cdot g(x)]$.

Find the indicated limit or state that it does not exist.

16) $\lim_{w \to 4} \sqrt{-2w^3 + 4w^2 + 84}$ 16) _____

17) $\lim_{x \to 3} \dfrac{3x^2 + 4}{8 - 9x}$ 17) _____

Solve the problem.

18) Given that $f(x) = 3\sqrt{x} + 5$, find $\lim_{x \to 25} [f(x) - f(25)/(x - 25)]$ 18) _____

19) Given that $f(x) = \dfrac{x}{4} + 3$, find $\lim_{x \to 2} [f(x) - f(2)/(x - 2)]$ 19) _____

20) Given that $f(x) = 2x^2 + 4$, find $\lim_{x \to 1} [f(x) - f(1)/(x - 1)]$ 20) _____

21) Given that $f(x) = 5x^2$, find $\lim_{x \to 9} [f(x) - f(9)/(x - 9)]$. 21) _____

Find the indicated limit or state that it does not exist.

22) $\lim_{x \to -7} \dfrac{x^2 + 8x + 7}{x^2 + 11x + 28}$ 22) _____

Find the right– or left–hand limit or state that it does not exist.

23) $\lim_{x \to 10^+} \dfrac{\sqrt{x - 10}}{x}$ 23) _____

24) $\lim_{x \to 5^-} \dfrac{x - 5}{\sqrt{x^2 - 25}}$ 24) _____

25) $\lim_{x \to 9^-} \dfrac{x - 9}{|x - 9|}$ 25) _____

Find the horizontal and vertical asymptotes for the graph of the given function and sketch its graph.

26) $f(x) = \dfrac{2}{(x - 1)^2}$ 26) _____

27) $f(x) = \dfrac{x}{x + 1}$ 27) _____

Find the limit.

28) $\lim_{x \to 2^-} \dfrac{x}{x - 2}$ 28) _____

29) $\lim_{x \to -5^-} \dfrac{1}{x + 5}$ 29) _____

30) $\lim_{t \to \pi^-} \dfrac{6t^2}{\sin t}$ 30) _____

31) $\lim_{x \to 3^-} \dfrac{x^2}{(x - 3)(11 - x)}$ 31) _____

32) $\lim_{x \to -\infty} \dfrac{4 + 2x^2}{x - 6x^2}$ 32) _____

33) $\lim_{x \to \infty} \frac{3x + 1}{10x^2 - 7}$ 33) _____

34) $\lim_{x \to \infty} \frac{4x}{x - 16}$ 34) _____

35) $\lim_{x \to \infty} \frac{\sqrt{5x + 6}}{x + 7}$ 35) _____

36) $\lim_{x \to \infty} \sqrt{\frac{49x^2}{6 + 4x^2}}$ 36) _____

Find the limit or state that it does not exist.

37) $\lim_{x \to \infty} \frac{\cos\left(\frac{2}{x}\right)}{8 + \frac{2}{x}}$ 37) _____

38) $\lim_{x \to \infty} \frac{1}{x} \sin x$ 38) _____

Find the limit.

39) $\lim_{x \to 0} \frac{4x \cos x}{\sin x}$ 39) _____

40) $\lim_{x \to 0} \frac{\sin 10x}{x \sec x}$ 40) _____

Simplify the expression.

41) $\ln (e^{8 \ln x})$ 41) _____

42) $e^{x - 2 \ln x}$ 42) _____

Solve the problem.

43) $6500 is invested at 8% compounded quarterly. In how many years will the account have grown to $8500? Round your answer to the nearest tenth of a year. 43) _____

A) 12.9 years B) 3.5 years C) 1.0 years D) 3.4 years

Solve.

44) Use the approximations $\ln 4 \approx 1.386$ and $\ln 5 \approx 1.609$ together with the properties of natural logarithms to calculate an approximation to $\ln 20$. 44) _____

State whether the function is continuous at the indicated point. If it is not continuous, tell why.

45) $h(t) = |t - 4|$; $t = 4$ 45) _____

46) $f(x) = \dfrac{7}{x - 6}$; $x = 6$ 46) _____

Determine the points at which the function is discontinuous.

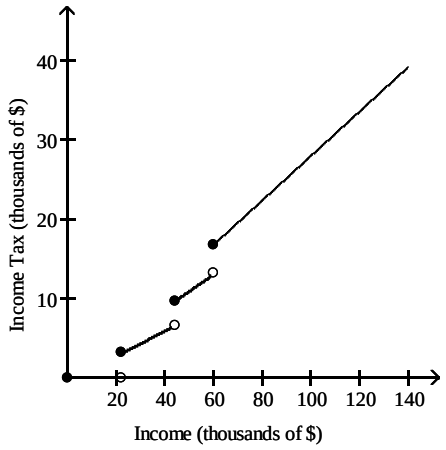
47) $h(x) = \dfrac{5x - 1}{\sqrt{x - 3}}$ 47) _____

Find a value for a so that the function f(x) is continuous.

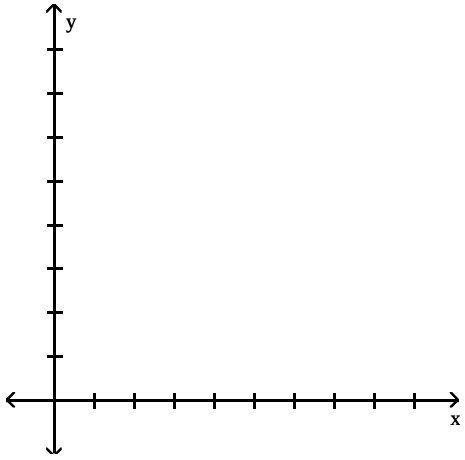
48) $f(x) = \begin{cases} x^2 + x + a, & x < 2 \\ x^3, & x \geq 2 \end{cases}$ 48) _____

Solve the problem.

49) The graph below shows the amount of income tax that a single person must pay on his or her income when claiming the standard deduction. Identify the income levels where discontinuities occur and explain the meaning of the discontinuities. 49) _____



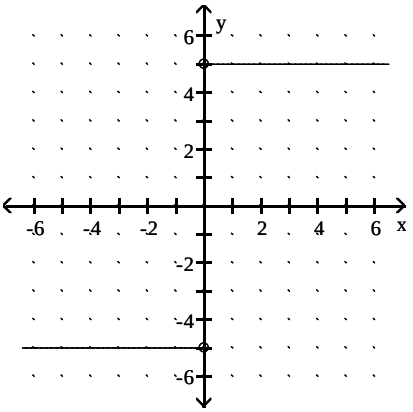
50) Suppose a car rental company charges \$114 for the first day and \$64 for each additional or partial day. Let C(x) be the cost of renting a car as a function of the number of days. Graph y = C(x). Find the intervals on which the function is continuous. 50) _____



1) $\frac{17}{14}$

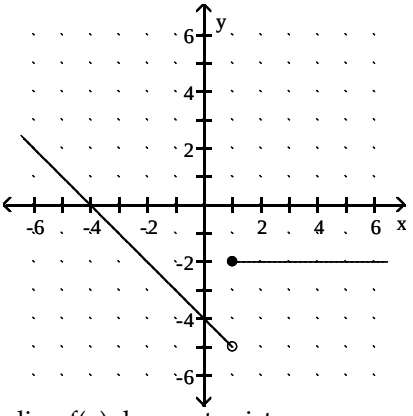
2) –21

3)



$\lim_{x \to 0^-} f(x) = -5$

4)



$\lim_{x \to 1} f(x)$ does not exist

5) 4; –4

6) –2; does not exist

7) Does not exist; 1

8) $\frac{3}{4}$; –1

9) –10

10) Does not exist

11) 0.07

12) If x is within 0.24 of 2, then f(x) is within 1 of 5

13) For each given number $\varepsilon > 0$, there is a corresponding $\delta > 0$, such that for all x,
$0 < |x - x_0| < \delta \Rightarrow |f(x) - L| < \varepsilon$.

14) $-\frac{43}{8}$

15) 56

16) $2\sqrt{5}$

17) $-\frac{31}{19}$

18) $\frac{3}{10}$

19) $\frac{1}{4}$

20) 4

21) 90

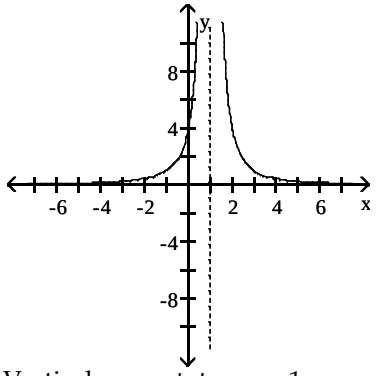
22) 2

23) 0

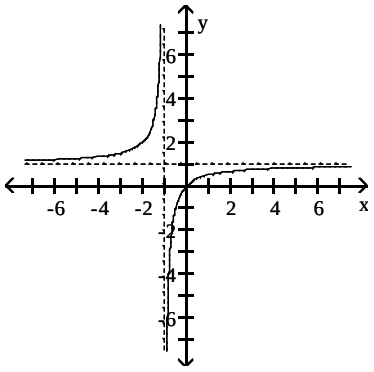
24) Does not exist

25) –1

26) Vertical asymptote: x = 1
Horizontal asymptote: y = 0



27) Vertical asymptote: x = –1
Horizontal asymptote: y = 1



28) $-\infty$

29) $-\infty$

30) ∞

31) $-\infty$

32) $-\frac{1}{3}$

33) 0

34) 4

35) 0

36) $\frac{7}{2}$

37) $\frac{1}{8}$

38) 0

39) 4

40) 10

41) $\ln x^8$

42) $\frac{e^x}{x^2}$

43) D

44) 2.995

45) Continuous

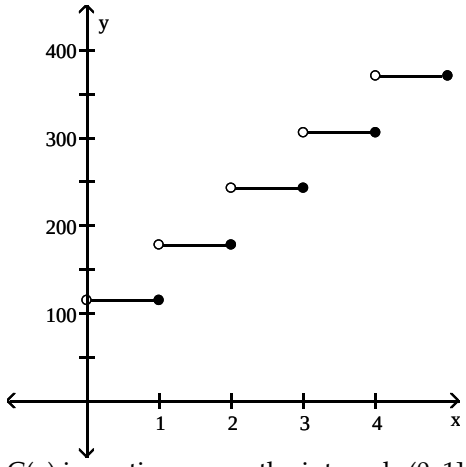
46) Not continuous; f(6) does not exist and $\lim_{x \to 6} f(x)$ does not exist

47) $(-\infty, 3]$

48) a = 2

49) Discontinuities at x = \$22,000, x = \$44,000, and x = \$60,000. Discontinuities represent boundaries between tax brackets.

50)



C(x) is continuous on the intervals (0, 1], (1, 2], (2, 3], . . .