

2.1-2.2 Chapter 2

1. Determine $\lim_{x \rightarrow 3} (5 - 2x + x^2)$ by substitution.
 (A) 2 (B) 8 (C) 10 (D) 12 (E) 20

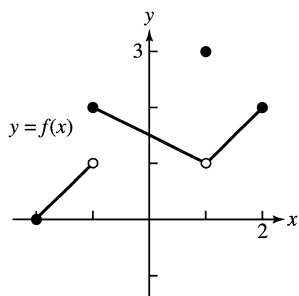
1. _____

2. Find $\lim_{x \rightarrow 5} \frac{5 - 6x + x^2}{5 - x}$, if it exists.
 (A) -4 (B) 0 (C) 4
 (D) 6 (E) Does not exist

2. _____

3. For the function $y = f(x)$ whose graph is shown below, which statement is false?

3. _____



- (A) $\lim_{x \rightarrow 1} f(x) = 1$
 (B) $\lim_{x \rightarrow 2^-} f(x) = 2$
 (C) $\lim_{x \rightarrow 0^+} f(x) = \lim_{x \rightarrow 0^-} f(x)$
 (D) $\lim_{x \rightarrow -1} f(x) = 2$
 (E) $\lim_{x \rightarrow -1^+} f(x) = 2$

4. Let $f(x) = \begin{cases} x^2 - 2, & x < 1 \\ -\frac{1}{2}x + 1, & x \geq 1 \end{cases}$. What is $\lim_{x \rightarrow 1^+} f(x)$?

4. _____

- (A) -1 (B) $\frac{1}{2}$ (C) 1
 (D) 1.73 (E) Does not exist

5. Find $\lim_{x \rightarrow 3^+} \frac{x + 3}{x - 3}$
 (A) $-\infty$ (B) -6 (C) 0 (D) 6 (E) ∞

5. _____

6. Which of the following is a horizontal asymptote for

6. _____

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

- (A) $y = -3$ (B) $y = -2$ (C) $y = 2$
 (D) $y = 3$ (E) $y = 4$

7. Find $\lim_{x \rightarrow \infty} \frac{6x + 1}{|6 - 2x|}$
 (A) -3 (B) 0 (C) 1 (D) 3 (E) Does not exist

7. _____

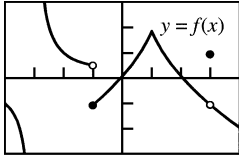
8. Which of the following is a right end behavior model for $y = x^3 - e^{-x}$?

8. _____

- (A) $-x^3$ (B) x^3 (C) $-e^{-x}$ (D) e^{-x} (E) e^x

2.3–2.4 Chapter 2

1. The function f whose graph is shown below is continuous at which of the following points?



$[-4, 4]$ by $[-3, 3]$

- (A) $x = -3$ (B) $x = -1$ (C) $x = 1$
 (D) $x = 3$ (E) All of these.

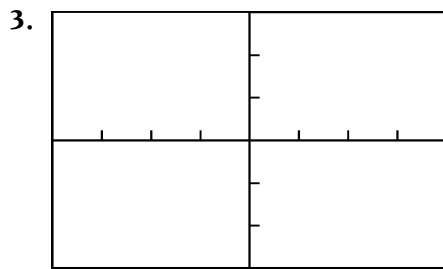
1. _____

2. The function f whose graph is shown in question 1 has a nonremovable discontinuity at which of the following points or sets of points?

- (A) $x = -3$ (B) $x = -1$ (C) $x = 1$
 (D) $x = 3$ (E) $x = -3$ and $x = -1$

2. _____

3. Sketch a possible graph for a function f that has the stated properties. $f(-2)$ exists, $\lim_{x \rightarrow -2} f(x)$ exists, f is not continuous at $x = -2$, and $\lim_{x \rightarrow 1} f(x)$ does not exist.



$[-4, 4]$ by $[-3, 3]$

3. _____

4. Find the average rate of change of the function $f(x) = 100 - 16x^2$ over the interval $[0, 2]$.

- (A) -64 (B) -36 (C) -32 (D) 32 (E) 36

4. _____

5. Find the slope of the curve $y = x^2 + x$ at $x = 3$.

- (A) 7 (B) 8 (C) 9 (D) 10 (E) 11

5. _____

6. The equation for free fall on Mars is $s = 6.1t^2$ ft, where t is in seconds. Assume a rock is dropped from a 100-ft cliff. Find the speed of the rock at $t = 3.5$ sec.

- (A) 4 ft/sec (B) 21.75 ft/sec
 (C) 28.57 ft/sec (D) 42.7 ft/sec
 (E) 74.725 ft/sec

6. _____

7. Let $f(x) = \begin{cases} x^2 - 2, & x \leq 1 \\ 1.5x - 2.5, & x > 1 \end{cases}$

Determine whether the curve $y = f(x)$ has a tangent at $x = 1$. If it does, give its slope.

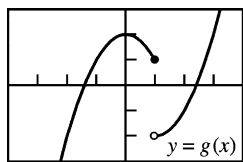
- (A) 1.5 (B) 2 (C) 2.5
 (D) 3 (E) No tangent

7. _____

A Chapter 2

Directions: Show all steps leading to your answers, including any intermediate results obtained using a graphing utility. Use the back of the test or another sheet of paper if necessary.

1. Use the graph to estimate the limits and value of the function, or explain why the limits do not exist.



$[-4, 4]$ by $[-3, 3]$

- (a) $\lim_{x \rightarrow 1^-} g(x)$
 (b) $\lim_{x \rightarrow 1^+} g(x)$
 (c) $\lim_{x \rightarrow 1} g(x)$
 (d) $g(1)$

1. (a) _____
 (b) _____
 (c) _____
 (d) _____

2. Determine the limit by substitution.

$$\lim_{x \rightarrow -3} (7 - 2x - x^2)$$

3. Assume that $\lim_{x \rightarrow b} f(x) = -4$ and $\lim_{x \rightarrow b} g(x) = 8$. Find

$$\lim_{x \rightarrow b} (f(x) - g(x)).$$

- (A) -12 (B) -2 (C) $-1/2$ (D) $1/2$ (E) 4

4. Find the limit graphically. Show how the Sandwich Theorem can be used to confirm your answer.

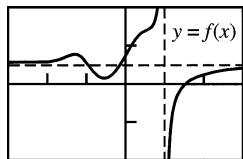
$$\lim_{x \rightarrow 0} \left(3 + x^2 \sin \frac{1}{x} \right)$$

5. For $f(x) = \frac{|4 - 3x|}{6x + 1}$, use graphs and tables to find

- (a) $\lim_{x \rightarrow \infty} f(x)$ and (b) $\lim_{x \rightarrow -\infty} f(x)$.
 (c) Identify any horizontal asymptotes.

6. Consider the function $f(x)$ given below. Which of the following appear to be true about $f(x)$?

- I. The line $y = \frac{1}{2}$ is a horizontal asymptote.
 II. $\lim_{x \rightarrow 2} f(x) = 2$
 III. The line $x = 1$ is a vertical asymptote.
 IV. $\lim_{x \rightarrow +\infty} f(x) = \lim_{x \rightarrow -\infty} f(x)$



$[-3, 3]$ by $[-2, 2]$

- (A) I and III
 (B) III and IV
 (C) I, II, and III
 (D) I, III, and IV
 (E) I, II, III, and IV

2. _____
 3. _____
 4. _____
 5. (a) _____
 (b) _____
 (c) _____
 6. _____

7. (a) Find the vertical asymptotes of the graph of

$$f(x) = \frac{3 - x}{x^2 - 16}$$

(b) Describe the behavior of $f(x)$ to the left and right of each vertical asymptote.

8. For the function $y = e^x - 2x^3 + 15x$, find:

- (a) a simple basic function right end behavior model, and
 (b) a simple basic function left end behavior model.

9. Find the points of discontinuity of the function

$$y = \frac{x^2 - 3x - 4}{x^2 - 7x + 12}$$

For each discontinuity, identify the type of discontinuity (removable, jump, infinite, or oscillating).

10. Find a value a so that the function

$$f(x) = \begin{cases} 5 - ax^2, & x < 1 \\ 4 + 3x, & x \geq 1 \end{cases} \text{ is continuous.}$$

11. Sketch a possible graph for a function f , where $f(-2)$ exists, $\lim_{x \rightarrow -2} f(x) = 2$, and f is not continuous at $x = -2$.

7. (a) _____

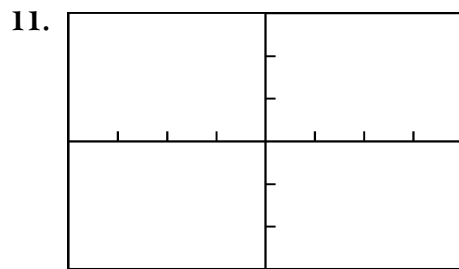
(b) _____

8. (a) _____

(b) _____

9. _____

10. _____



$[-4, 4]$ by $[-3, 3]$

11. _____

12. _____

12. Use the concept of composite functions to explain why $h(x) = |x^2 - 4x - 6|$ is a continuous function.

13. Find the average rate of change of the function $f(x) = x^3 - x^2 - 4$ over the interval $[-3, 5]$.

14. For the function $f(x) = x^2 + 9$ at the point $(2, 13)$, find

- (a) the slope of the curve
 (b) an equation of the tangent line
 (c) an equation of the normal line

14. (a) _____

(b) _____

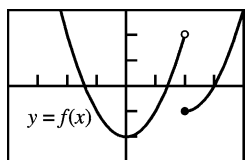
(c) _____

15. The equation for free fall at the surface of the planet Quixon is $s = 3.8t^2$ m with t in sec. Assume a rock is dropped from the top of a 400-m cliff. Find the speed of the rock at $t = 6$ sec.

15. _____

Directions: Show all steps leading to your answers, including any intermediate results obtained using a graphing utility. Use the back of the test or another sheet of paper if necessary.

1. Use the graph to estimate the limits and value of the function, or explain why the limits do not exist.



$[-4, 4]$ by $[-3, 3]$

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

1. (a) _____
 (b) _____
 (c) _____
 (d) _____

2. Determine the limit by substitution.

$$\lim_{x \rightarrow -2} (-6x^2 + 5x + 12)$$

2. _____

3. Assume that $\lim_{x \rightarrow b} f(x) = -3$ and $\lim_{x \rightarrow b} g(x) = -2$. Find the value of $\lim_{x \rightarrow b} (f(x) - g(x))$.

- (A) -5 (B) -1 (C) 1 (D) 5 (E) 6

3. _____

4. Find the limit graphically. Show how the Sandwich Theorem can be used to confirm your answer.

$$\lim_{x \rightarrow 0} \left(5 - x^2 \cos \frac{1}{x} \right)$$

4. _____

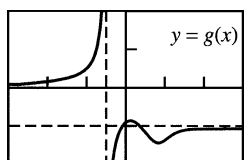
5. For $f(x) = \frac{|4x + 3|}{-2x + 6}$, use graphs and tables to find

- (a) $\lim_{x \rightarrow \infty} f(x)$ and (b) $\lim_{x \rightarrow -\infty} f(x)$.
 (c) Identify any horizontal asymptotes.

5. (a) _____
 (b) _____
 (c) _____

6. Consider the function $g(x)$ given below. Which of the following appear to be true about $g(x)$?

- I. The line $x = \frac{1}{2}$ is a vertical asymptote.
 II. $\lim_{x \rightarrow -1} g(x) = \frac{1}{2}$
 III. The line $y = -1$ is a horizontal asymptote.
 IV. $\lim_{x \rightarrow +\infty} g(x) = \lim_{x \rightarrow -\infty} g(x)$



$[-3, 3]$ by $[-2, 2]$

- (A) I and II
 (B) I and III
 (C) II and III
 (D) II and IV
 (E) II, III and IV

6. _____

7. (a) Find the vertical asymptotes of the graph of

$$f(x) = \frac{x - 1}{x^2 + 2x - 8}$$

(b) Describe the behavior of $f(x)$ to the left and right of each vertical asymptote.

8. For the function $y = 3x^2 - 5x + 7^{-x}$, find:

- (a) a simple basic function right end behavior model, and
- (b) a simple basic function left end behavior model.

9. Find the points of discontinuity of the function

$$y = \frac{x^2 - 3x - 4}{x^2 - 7x + 12}$$

For each discontinuity, identify the type of discontinuity (removable, jump, infinite, or oscillating).

10. Find a value m so that the function

$$g(x) = \begin{cases} mx + 4, & x \leq 3 \\ x^2 - 11, & x > 3 \end{cases} \text{ is continuous.}$$

11. Sketch a possible graph for a function f , where $\lim_{x \rightarrow 3} f(x)$ exists, $f(3) = 1$, and f is not continuous at $x = 3$.

7. (a) _____

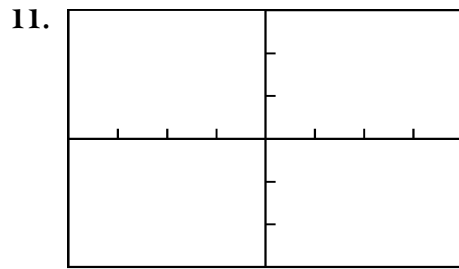
(b) _____

8. (a) _____

(b) _____

9. _____

10. _____



11.

[-4, 4] by [-3, 3]

12. Use the concept of composite functions to explain why $h(x) = \sin(x^5 + 2x - 3)$ is a continuous function.

13. Find the average rate of change of the function $f(x) = 2x^3 - 5x + 3$ over the interval $[-2, 1]$.

14. For the function $f(x) = x^2 - 4$ at the point $(4, 12)$, find

- (a) the slope of the curve
- (b) an equation of the tangent line
- (c) an equation of the normal line

15. The equation for free fall at the surface of the moon is $s = 31.8t^2$ in. with t in sec. Assume a rock is dropped from the top of a 12,000-in. cliff. Find the speed of the rock at $t = 4$ sec.

12. _____

13. _____

14. (a) _____

(b) _____

(c) _____

15. _____