1. Evaluate \( \lim_{h \to 0} \frac{(11 + h)^{-1} - 11^{-1}}{h} \), if it exists.

   a. \( -\frac{3}{37} \)
   b. Does not exist
   c. \( -\frac{1}{16} \)
   d. \( -\frac{1}{121} \)
   e. \( -\frac{3}{169} \)

2. Which of the following statements are correct?

   a. \( \lim_{x \to -9} \frac{|x + 9|}{x + 9} = 0 \)
   b. \( \lim_{x \to -9} |x + 9| = 0 \)
   c. \( \lim_{x \to 9} \frac{|x - 9|}{x - 9} = 1 \)
   d. \( \lim_{x \to -9} |x + 9| = 9 \)
   e. \( \lim_{x \to -9} \frac{|x + 9|}{x + 9} = 9 \)

3. The function is defined by
Which of the following is the graph of this function?

\[
f(x) = \begin{cases} 
-5 & \text{if } x < 0 \\
0 & \text{if } x = 0 \\
5 & \text{if } x > 0 
\end{cases}
\]

Which of the following is the graph of this function?
c. 

\[ \begin{array}{|c|c|}
\hline
\text{x} & \text{y} \\
\hline
-8 & 4 \\
-4 & 4 \\
4 & -4 \\
\hline
\end{array} \]

d. 

\[ \begin{array}{|c|c|}
\hline
\text{x} & \text{y} \\
\hline
-8 & 4 \\
-4 & 4 \\
4 & -4 \\
\hline
\end{array} \]
Find each of the following limits, if it exists.

(i) \( \lim_{{x \to 0^+}} f(x) = \) ________

(ii) \( \lim_{{x \to 0^-}} f(x) = \) ________

(iii) \( \lim_{{x \to 0}} f(x) = \) ________

(iv) \( \lim_{{x \to 0}} |f(x)| = \) ________

4.

Let

\[ f(x) = \begin{cases} 
9 - \frac{x^2}{2} & \text{if } x \leq 3 \\
9x - 1 & \text{if } x > 3
\end{cases} \]

Find.
\[ \lim_{{x \to 3^-}} f(x) = \ \underline{\ \ \ } \]

\[ \lim_{{x \to 3^+}} f(x) = \ \underline{\ \ \ } \]

Does \[ \lim_{{x \to 3}} f(x) \] exist?

\[ \quad \underline{\ \ } \]

Which of the following is the graph of \( f \).
5.
Write an equation that expresses the fact that a function \( f \) is continuous at the number \( 4 \).

a. \[ \lim_{{x \to 4}} f(x) = f(4) \]

b. \[ \lim_{{x \to 4^+}} f(x) = f(4) \]
c. \( \lim_{x \to 4} f(x) = \lim_{x \to 4^+} f(x) \)

d. \( \lim_{x \to 4^-} f(x) = f(4) \)

e. \( \lim_{x \to 4^-} f(x) = \lim_{x \to 4^+} f(x) \)

6.
If \( f \) is continuous on \([2, 5]\), which of the following statements must be true?

a. \( \lim_{x \to 4} f(x) = f(4) \)

b. If \( \lim_{x \to 2^-} f(x) \) exists, then it is equal to \( f(2) \)

c. \( \lim_{x \to 5^-} f(x) = f(5) \)

d. \( f(x) \) is defined for all \( x \in [2, 5] \)

e. \( \lim_{x \to 2^-} f(x) \) exists

7.
If \( f \) and \( g \) are continuous functions with \( f(4) = 4 \) and \( \lim_{x \to 4} [6f(x) - g(x)] = 22 \), find \( g(4) \).

\[ g(4) = \quad ? \]

8.
At which of the following values is the function continuous?

\[ f(x) = x^2 + \sqrt{8 - x} \]

Select the correct answer(s).

a. -6
b. 8  
c. 3  
d. 16  
e. 0

9. 
What is the domain of the function?

\[ h(x) = \frac{\sin x}{x + 1} \]

Is it continuous at every number?

Answer yes or no.

10. 
Use the definition of continuity to evaluate

\[ \lim_{x \to 144} \frac{25 + \sqrt{x}}{25 + x} \]

a. \( \frac{1}{2} \)

b. 3

c. \( \frac{45}{17} \)

d. \( \frac{37}{13} \)

e. \( \frac{5}{2} \)

11. 
Evaluate the limit.

\[ \lim_{x \to -\infty} \frac{9x^2 - x + 2}{8x^2 + 4x - 3} \]
12. Find the limit.
\[
\lim_{x \to \infty} \frac{3x + 9}{x - 3}
\]

13. Find the limit.
\[
\lim_{x \to \infty} \frac{x^3 + 2x}{4x^3 - x^2 + 5}
\]

14. Find
\[
\lim_{x \to \infty} \left( \sqrt{x^2 + 8x} - \sqrt{x^2 + 7x} \right)
\]

a. \(\sqrt{8} - \sqrt{7}\)
b. 15
c. \(\frac{1}{2}\)
d. \(\frac{1}{2}\)
e. \(\frac{15}{2}\)

15. A curve has equation \(y = f(x)\). Determine an expression for the slope of the tangent line at \(P(9, f(9))\).

a. \(\lim_{x \to 9} \frac{f(x) + f(9)}{x + 9}\)
b. \(\lim_{x \to 9} \frac{f(x) - f(9)}{x - 9}\)
c. \(\lim_{x \to 9} \frac{f(x) - f(9)}{9 - x}\)
d. \(\lim_{x \to 0} \frac{f(x) + f(0)}{x}\)
16.

Consider the slope of the given curve at each of the five points shown. List these five slopes in decreasing order.

17.

Find the slope of the tangent line to the curve \( y = x^3 \) at the point \((-2, -8)\) using Definition 1.

a. 3  
b. 21  
c. -6  
d. 12  
e. 30

18.

Find an equation of the tangent line to the curve \( y = x^3 \) at the point \((-5, -125)\).

a. \( y = 75x + 240 \)  
b. \( y = 80x + 245 \)
c. \( y = 80x + 250 \)

d. \( y = 80x + 240 \)

e. \( y = 75x + 250 \)

19.

Find the equation of the tangent line to the curve \( y = \frac{3x}{(x + 1)^2} \) at the point \((0, 0)\).

a. \( y = 13x \)

b. \( y = -2x \)

c. \( y = -7x \)

d. \( y = 3x \)

e. \( y = 8x \)

20.

If a ball is thrown into the air with an initial velocity of 80 ft/s, then its height (in feet) after \( t \) seconds is given by \( y = 80t - 16t^2 \). Find the velocity when \( t = 4 \).

a. -43 ft/s

b. -38 ft/s

c. -28 ft/s

d. -33 ft/s

e. -48 ft/s