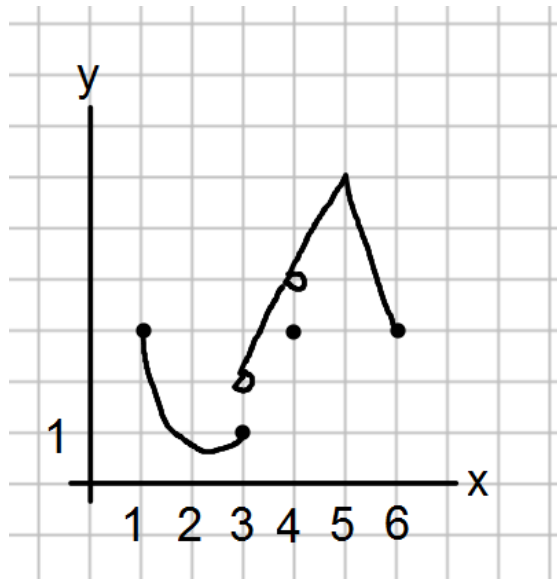




1. The graph of the function f is shown above. Which of the following statements is false?

- a. $\lim_{x \rightarrow 1^+} f(x)$ exists
- b. $\lim_{x \rightarrow 2} f(x)$ exists
- c. $\lim_{x \rightarrow 3} f(x)$ exists
- d. $\lim_{x \rightarrow 4} f(x)$ exists
- e. $\lim_{x \rightarrow 5} f(x)$ exists

2. The line $y = 3$ is a horizontal asymptote to the graph of which of the following functions?

- a. $f(x) = \frac{3x^2}{1-x^2}$
- b. $f(x) = \frac{\cos(3x)}{x}$
- c. $f(x) = \frac{x}{3x-1}$
- d. $f(x) = \frac{12x^2-1}{1+6x+4x^2}$
- e. $f(x) = 3x$

3. Let $f(x)$ be a function that is continuous on the closed interval $[3,7]$ with $f(3) = 5$ and $f(7) = 25$. Which of the following is guaranteed by the Intermediate Value Theorem?
- a. $f(x) = 11$ has at least one solution on the open interval $(3,7)$
 - b. $f(5) = 15$
 - c. f attains a minimum on the open interval $(3,7)$
 - d. $f(x) = 5$ has at least one solution on the open interval $(3,7)$
 - e. $f(x) > 0$ for every x in the open interval $(3,7)$
4. $\lim_{x \rightarrow -3} \frac{x^2+5x+6}{x^2-9}$ is
- a. 0
 - b. 1
 - c. $\frac{1}{6}$
 - d. $-\frac{5}{6}$
 - e. non-existent
5. Let f be the function given by $f(x) = \frac{(x+2)(x-1)(x-3)}{(x+2)^2(x-2)}$. For which of the following values of x is the function not continuous.
- a. 2 and -3 only
 - b. 2 only
 - c. 1 and 3 only
 - d. 2 and -2
 - e. 1, 3, and -2

6. For which of the following does $\lim_{x \rightarrow \infty} f(x) = 0$

I. $f(x) = \frac{e^x}{\ln x}$

II. $f(x) = \frac{x^{100}}{e^x}$

III. $f(x) = \frac{\ln x}{x^{99}}$

- a. II and III
- b. I only
- c. I and II only
- d. II only
- e. I, II and III

7. $\lim_{x \rightarrow 7^-} \frac{|x-7|}{x-7}$ is

- a. -7
- b. -1
- c. 1
- d. 7
- e. non-existent

8. Let f be the function defined by $f(x) = \frac{(3x+2)(1-2x)}{(3x+4)^2}$. Which of the following is its horizontal asymptote?

- a. $y = 0$
- b. $y = 1$
- c. $y = \frac{1}{3}$
- d. $y = -\frac{2}{3}$
- e. $y = -\frac{2}{9}$

9. $\lim_{x \rightarrow \infty} \frac{x^5}{e^{5x}}$

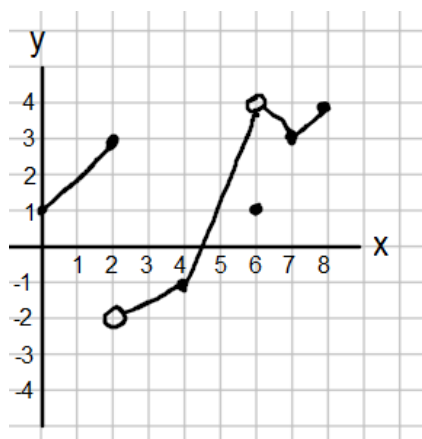
a. 0

b. $\frac{2}{25}$

c. $\frac{2}{5}$

d. 1

e. ∞



10. The graph of $f(x)$ is shown above. Which of the following are true about $f(x)$?

I. $\lim_{x \rightarrow 6} f(x) = f(6)$

II. $\lim_{x \rightarrow 2^+} f(x) = f(2)$

III. $\lim_{x \rightarrow 6^-} f(x) = \lim_{x \rightarrow 6^+} f(x)$

a. I only

b. III only

c. I and II only

d. I and III only

e. I, II, and III

11. Let f be a function defined by $f(x) = e^x(2x^2 - x - 3)$.

a. Find $\lim_{x \rightarrow \infty} f(x)$

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

12. Let g be defined as the function $g(x) = \begin{cases} \sqrt{25 - x^2} & \text{if } -5 \leq x \leq -3 \\ x + 7 & \text{if } -3 < x \leq 5 \end{cases}$

Is g continuous at $x = -3$? Use the definition of continuity to explain your answer.

13.

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

a. 4

b. 1

c. $\frac{1}{4}$

d. 0

e. -1

14.

For $x \geq 0$, the horizontal line $y = 2$ is an asymptote for the graph of the function f . Which of the following statements must be true?

- a. $f(0) = 2$
- b. $f(x) \neq 2$ for all $x \geq 0$
- c. $f(2)$ is undefined
- d. $\lim_{x \rightarrow 2} f(x) = \infty$
- e. $\lim_{x \rightarrow \infty} f(x) = 2$

15.

Let f be the function defined by

$$f(x) = \begin{cases} \sqrt{x+1} & \text{for } 0 \leq x \leq 3 \\ 5-x & \text{for } 3 < x \leq 5 \end{cases}$$

Is f continuous at $x = 3$? Explain why or why not.

16.

Let f be the function given by $f(x) = 2xe^{2x}$.

- a. Find $\lim_{x \rightarrow \infty} f(x)$
- b. Find $\lim_{x \rightarrow -\infty} f(x)$

17.

Let f be the function defined as follows

$$f(x) = \begin{cases} |x-1| + 2 & \text{for } x < 1 \\ ax^2 + bx & \text{for } x \geq 1 \end{cases} \quad \text{where } a \text{ and } b \text{ are constants.}$$

- a. If $a = 2$ and $b = 3$, is f continuous for all x ? Justify your answer.
- b. Describe all values of a and b for which f is a continuous function.