

1. How many of the following statements about the function $y = f(x)$ graphed here are true?

(A) $\lim_{x \rightarrow 2} f(x) = 0.$

(B) $\lim_{x \rightarrow 1} f(x)$ does not exist.

(C) $\lim_{x \rightarrow x_0} f(x)$ exists at every point x_0 in $(-1, 1).$

(D) $\lim_{x \rightarrow x_0} f(x)$ exists at every point x_0 in $(1, 3).$

(A) 0 (B) 1 (C) 2 (D) 3 (E) 4

2. $\lim_{x \rightarrow -1} \frac{\sqrt{x^2 + 8} - 3}{x + 1} = ?$

(A) $\frac{3}{2}$

(B) $-\frac{1}{2}$

(C) $\frac{\sqrt{2}}{3}$

(D) $\frac{1}{6}$

(E) $-\frac{1}{3}$

3. Here are two assertions:

a) If $\lim_{x \rightarrow c} f(x)$ exists but $\lim_{x \rightarrow c} g(x)$ does not exist, then $\lim_{x \rightarrow c} (f(x) + g(x))$ does not exist.

b) If neither $\lim_{x \rightarrow c} f(x)$ nor $\lim_{x \rightarrow c} g(x)$ exists, then $\lim_{x \rightarrow c} (f(x) + g(x))$ does not exist.

Which of the following is correct?

- (A) a) and b) are both false
- (B) b) is true but a) is false
- (C) a) is true but b) is false
- (D) a) and b) are both true

4. $\lim_{t \rightarrow 4^-} (t - \epsilon \in t \square) = ?$

- (A) 0
- (B) 1
- (C) 2
- (D) 3
- (E) 4

5. Which of the following partial graphs shows the behavior of

$$f(x) = \frac{x^2 - 3x + 2}{x^3 - 2x^2} \quad \text{for } x \text{ near } 0?$$

A

B

C

D

6. Define $g(4)$ in a way that extends

$$g(x) = \frac{x^2 - 16}{x^2 - 3x - 4}$$

to be continuous at $x = 4$

(A) $\frac{4}{3}$

(B) 1

(C) $\frac{8}{5}$

(D) $\frac{5}{2}$

(E) $\frac{7}{6}$

7. The slope of the curve $y = \frac{x-1}{x+1}$ at the point $(0, -1)$ is

(A) $\frac{3}{2}$

(B) -1

(C) 0

(D) 2

(E) $\frac{7}{3}$

8. $y = f(x)$ $y = g(x)$ $y = h(x)$

From the graphs, which one of the following appears to be true?

(A) h is the derivative of f

(B) f is the derivative of g

(C) h is the derivative of g

(D) f is the derivative of h

(E) g is the derivative of f

9. If $y = \frac{12}{x} - \frac{4}{x^3} + \frac{1}{x^4}$, then

$$\left. \frac{dy}{dx} \right|_{x=1} = ?$$

- (A) - 4 (B) - 2 (C) 0 (D) 1 (E) 3

10. If $f(x) = x(x - 1)(x + 1)$, then $f''(-1) = ?$

- (A) - 6 (B) 0 (C) 2 (D) - 4 (E) 12

11. Suppose that u and v are differentiable functions of x and that

$$u(1) = 6, u'(1) = 0, v(1) = 2, v'(1) = - 1.$$

Find the value of $\frac{d}{dx} \left(\frac{u}{v} \right)$ at $x = 1$.

- (A) $\frac{1}{4}$ (B) $\frac{3}{2}$ (C) $-\frac{1}{36}$ (D) 2 (E) $-\frac{4}{3}$

12. The curves $y = x^2 + ax + b$ and $y = cx - x^2$ have a common tangent line at the point $(1,0)$. Then a, b , and c are, respectively,

- (A) 2,0,1 (B) -1,2,0 (C) -3,2,1 (D) -3,0,1 (E) 0,2,3