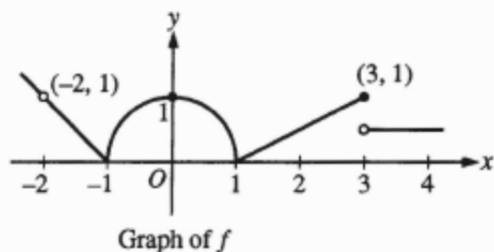


Limit Questions from the 2003 and 2008 Exams



78. The graph of a function f is shown above. For which of the following values of c does $\lim_{x \rightarrow c} f(x) = 1$?

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

$$f(x) = \begin{cases} \frac{x^2 - 4}{x - 2} & \text{if } x \neq 2 \\ 1 & \text{if } x = 2 \end{cases}$$

6. Let f be the function defined above. Which of the following statements about f are true?

- I. f has a limit at $x = 2$.
 - II. f is continuous at $x = 2$.
 - III. f is differentiable at $x = 2$.
- (A) I only
 - (B) II only
 - (C) III only
 - (D) I and II only
 - (E) I, II, and III

3. 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) $\lim_{x \rightarrow \infty} f(x) = 2$

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

- (A) 4 (B) 1 (C) $\frac{1}{4}$ (D) 0 (E) -1

19. What are all horizontal asymptotes of the graph of $y = \frac{5 + 2^x}{1 - 2^x}$ in the xy -plane?

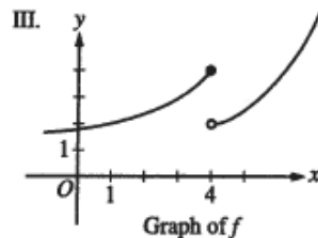
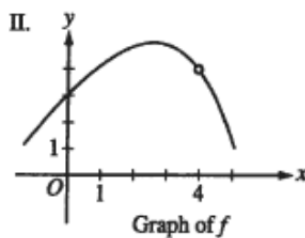
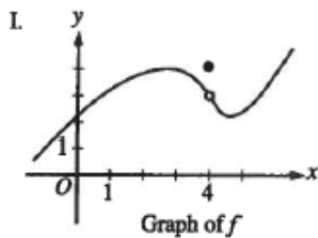
- (A) $y = -1$ only
- (B) $y = 0$ only
- (C) $y = 5$ only
- (D) $y = -1$ and $y = 0$
- (E) $y = -1$ and $y = 5$

$$f(x) = \begin{cases} x + 2 & \text{if } x \leq 3 \\ 4x - 7 & \text{if } x > 3 \end{cases}$$

20. Let f be the function given above. Which of the following statements are true about f ?

- I. $\lim_{x \rightarrow 3} f(x)$ exists.
 - II. f is continuous at $x = 3$.
 - III. f is differentiable at $x = 3$.
- (A) None
 - (B) I only
 - (C) II only
 - (D) I and II only
 - (E) I, II, and III

79. For which of the following does $\lim_{x \rightarrow 4} f(x)$ exist?

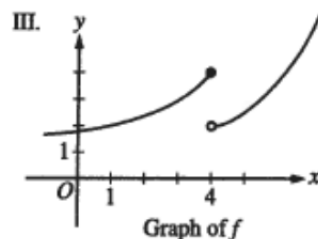
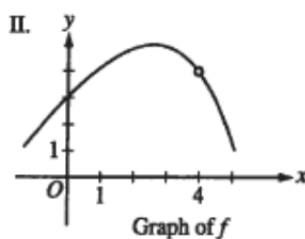
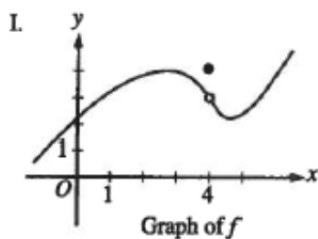


- (A) I only
 (B) II only
 (C) III only
 (D) I and II only
 (E) I and III only

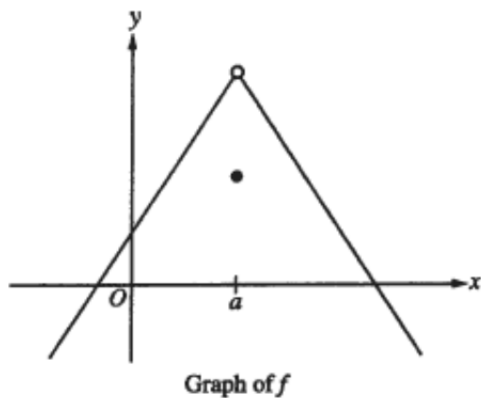
2. $\lim_{x \rightarrow 0} \frac{e^x - \cos x - 2x}{x^2 - 2x}$ is

- (A) $-\frac{1}{2}$ (B) 0 (C) $\frac{1}{2}$ (D) 1 (E) nonexistent

79. For which of the following does $\lim_{x \rightarrow 4} f(x)$ exist?

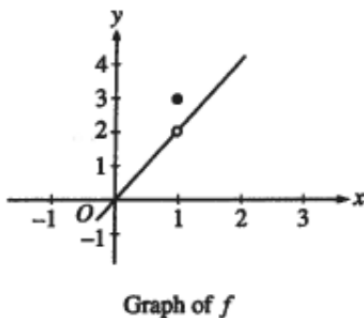


- (A) I only
 (B) II only
 (C) III only
 (D) I and II only
 (E) I and III only



76. The graph of the function f is shown above. Which of the following statements must be false?

- (A) $f(a)$ exists.
- (B) $f(x)$ is defined for $0 < x < a$.
- (C) f is not continuous at $x = a$.
- (D) $\lim_{x \rightarrow a} f(x)$ exists.
- (E) $\lim_{x \rightarrow a} f'(x)$ exists.



81. The graph of the function f is shown in the figure above. The value of $\lim_{x \rightarrow 1} \sin(f(x))$ is

- (A) 0.909
- (B) 0.841
- (C) 0.141
- (D) -0.416
- (E) nonexistent