

Unit 1 AP Questions

Name \_\_\_\_\_

AP Calculus

**No Calculator.** Show your work on a separate piece of paper.

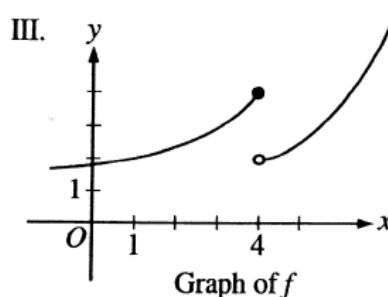
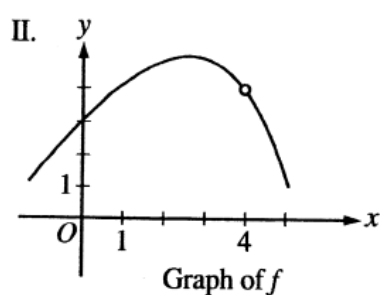
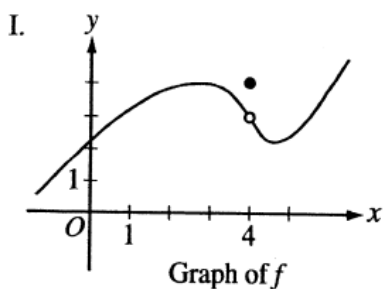
1. For  $x \geq 0$ , the horizontal line  $y = 2$  is an asymptote for the graph of the function  $f$ . Which of the following statements must be true?

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

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

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

3. 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

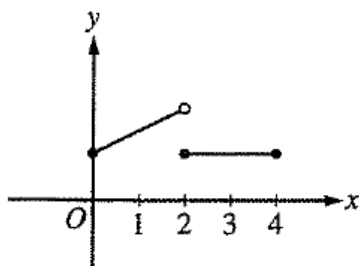
4. 
$$\lim_{x \rightarrow \infty} \frac{(2x - 1)(3 - x)}{(x - 1)(x + 3)}$$
 is

- (A) -3
- (B) -2
- (C) 2
- (D) 3
- (E) nonexistent

5. 
$$\lim_{x \rightarrow 0} \frac{5x^4 + 8x^2}{3x^4 - 16x^2}$$
 is

- (A)  $-\frac{1}{2}$
- (B) 0
- (C) 1
- (D)  $\frac{5}{3}$
- (E) nonexistent

6.

Graph of  $f$ 

The figure above shows the graph of a function  $f$  with domain  $0 \leq x \leq 4$ . Which of the following statements are true?

I.  $\lim_{x \rightarrow 2^-} f(x)$  exists.

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

III.  $\lim_{x \rightarrow 2} f(x)$  exists.

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

7.

$$f(x) = \begin{cases} \frac{(2x+1)(x-2)}{x-2} & \text{for } x \neq 2 \\ k & \text{for } x = 2 \end{cases}$$

Let  $f$  be the function defined above. For what value of  $k$  is  $f$  continuous at  $x = 2$ ?

- (A) 0      (B) 1      (C) 2      (D) 3      (E) 5

8. The function  $f$  is defined by  $f(x) = \sqrt{25 - x^2}$  for  $-5 \leq x \leq 5$ .

Let  $g$  be the function defined by  $g(x) = \begin{cases} f(x) & \text{for } -5 \leq x \leq -3 \\ x + 7 & \text{for } -3 < x \leq 5. \end{cases}$

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

9. 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.

10. Let  $f$  be a function defined by  $f(x) = \begin{cases} 1 - 2 \sin x & \text{for } x \leq 0 \\ e^{-4x} & \text{for } x > 0. \end{cases}$

Show that  $f$  is continuous at  $x = 0$ .