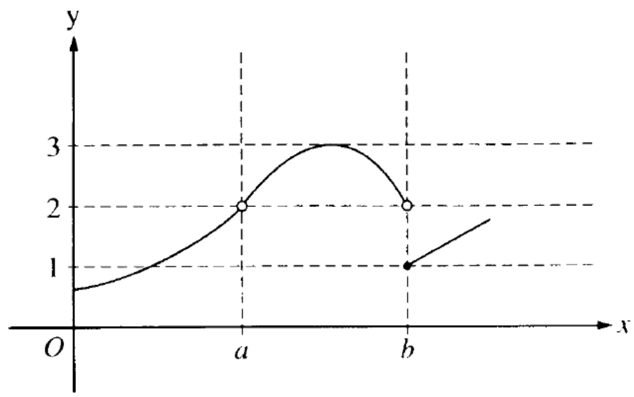
AP Calculus
Section I, Part A
Time 30 minutes
Number of Questions – 15

A CALCULATOR MAY NOT BE USED FOR THIS PART OF THE EXAM

Directions: Solve each of the following problems, using the available space for scratch work. After examining the form of the choices, decide which is the best of the choices given and fill in the corresponding circle on the answer sheet. No credit will be given for anything written in the exam book. Do not spend too much time on any one problem.

(1) Unless otherwise specified, the domain of a function f is assumed to be the set of all real numbers x for which $f(x)$ is a real number.

(2) The inverse of a trigonometric function f may be indicated using the inverse function notation f^{-1} or with the prefix "arc" (e.g. $\sin^{-1} x = \arcsin x$).



1. The graph of the function f is shown in the figure above. Which of the following statements about f is true?

(A) $\lim_{x\to a} f(x) = \lim_{x\to b} f(x)$

(B) $\lim_{x\to a} f(x) = 2$

(C) $\lim_{x\to b} f(x) = 2$

(D) $\lim_{x\to b} f(x) = 1$

(E) $\lim_{x\to a} f(x)$ does not exist.

2. $\lim_{x \to 1} \frac{x}{\ln x}$ is

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

3. If $\begin{cases} \ln(x) & \text{for } 0 < x \leq 2 \\ x^2 \ln(2) & \text{for } 2 < x \leq 4, \end{cases}$ then $\lim_{x \to 2} f(x)$ is

(A) ln 2 (B) ln 8 (C) ln 16 (D) 4 (E) nonexistent

4. For $x \geq 0$, the horizontal line $y = 2$ is an asymptote for the graph of 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) $\lim_{x \to 2} f(x) = \infty$

(E) $\lim_{x \to \infty} f(x) = 2$

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

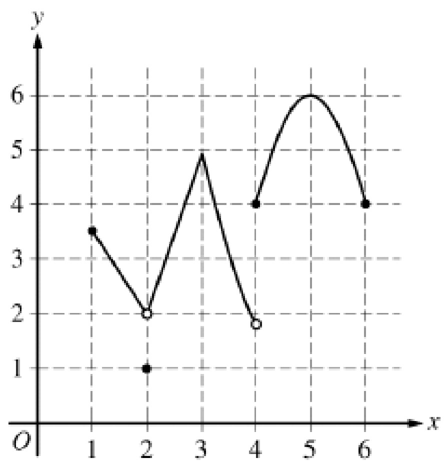
(A) 4 (B) 1 (C) $\frac{1}{4}$ (D) 0 (E) -1

6. $\lim_{x \to \infty} \frac{(2x-1)(3-x)}{(x-1)(x+3)}$

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

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

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



Graph of f

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

(A) $\lim_{x \to 2} f(x)$ exists.

(B) $\lim_{x \to 3} f(x)$ exists.

(C) $\lim_{x \to 4} f(x)$ exists.

(D) $\lim_{x \to 5} f(x)$ exists.

(E) The function f is continuous at $x = 3$

9. $\lim_{x \to 1} \frac{\ln(4+h)-\ln(4)}{h}$

(A) $\ln 2$ (B) $\ln(\frac{5}{4})$ (C) $\ln(\frac{4}{5})$ (D) 0 (E) nonexistent

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

10. 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

11. $\lim\limits_{x\to-\infty} \frac{2x^2+1}{(2-x)(2+x)}$

(A) -4 (B) -2 (C) 1 (D) 2 (E) nonexistent

12. $\lim\limits_{x\to\pi} \dfrac{\cos x}{x}$ is

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

13. $\lim_{x\to\infty} \frac{\sqrt{9x^4+1}}{x^2-3x+5}$ is

(A) 3 (B) 9 (C) -1 (D) 0 (E) nonexistent

$$f(x) = \begin{cases} \dfrac{x^2 - x}{2 - x} & \text{for } x \neq 0 \\ k & \text{for } x = 0, \end{cases}$$

14. Let f be the function defined above. For what value of k is f continuous at $x = 0$

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

15. Let $f(x) = \begin{cases} \frac{x^2+x}{x} & \text{for } x \neq 0 \\ 1 & \text{for } x = 0, \end{cases}$ Which of the following statements are true?

I. $f(0)$ exists

II. $\lim_{x\to 0} f(x)$ exists.

III. f is continuous at $x = 0$

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

AP Calculus
Section I, Part B
Time 24 minutes
Number of Questions – 8

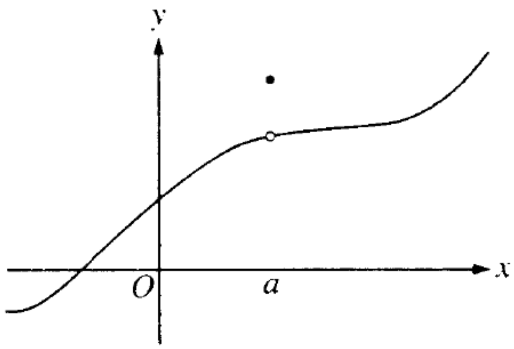
A GRAPHING CALCULATOR IS REQUIRED FOR SOME QUESTIONS ON THIS PART OF THE EXAM

Directions: Solve each of the following problems, using the available space for scratch work. After examining the form of the choices, decide which is the best of the choices given and fill in the corresponding circle on the answer sheet. No credit will be given for anything written in the exam book. Do not spend too much time on any one problem.

(1) The exact numerical value of the correct answer does not always appear among the choices given. When this happens, select from among the choices the number that best approximates the exact numerical value.

(2) Unless otherwise specified, the domain of a function f is assumed to be the set of all real numbers x for which $f(x)$ is a real number.

(3) The inverse of a trigonometric function f may be indicated using the inverse function notation f^{-1} or with the prefix “arc” (e.g. $\sin^{-1} x = \arcsin x$).



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

(A) f is continuous at $x = a$.

(B) f has a relative maximum at $x = a$.

(C) $x = a$ is in the domain of f.

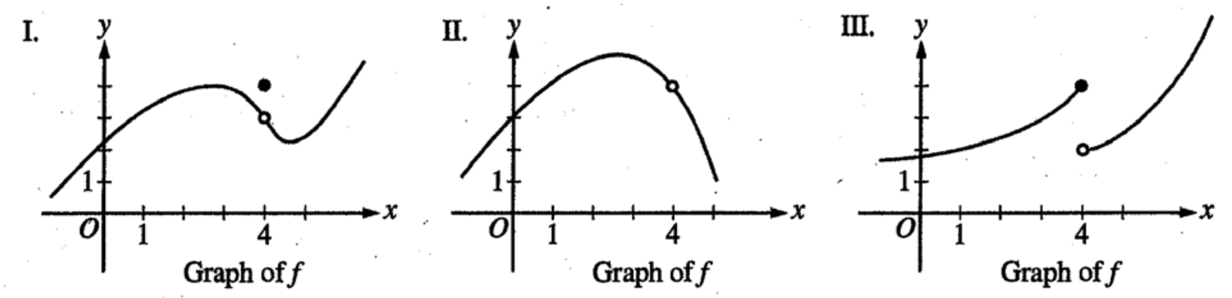
(D) $\lim_{x \to a^+} f(x)$ is equal to $\lim_{x \to a^-} f(x)$

(E) $\lim_{x \to a} f(x)$ exists.

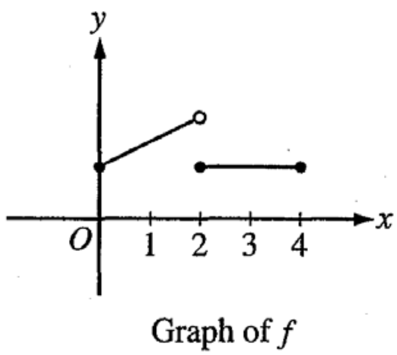
77. If $a \neq 0$, then $\lim_{x \to a} \frac{x^2 - a^2}{x^4 - a^4}$ is

(A) $\frac{1}{a^2}$ (B) $\frac{1}{2a^2}$ (C) $\frac{1}{6a^2}$ (D) 0 (E) nonexistent

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



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



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

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

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

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

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

$\lim_{x\to -5} f(x) = 4$	$\lim_{x\to 5} f(x) = 2$	$\lim_{x\to 5} g(x) = 5$

80. The table above gives selected limits of the functions f and g.
What is $\lim_{x\to 5} f(-x) + 3g(x)$?

(A) 19 (B) 17 (C) 13 (D) 9 (E) 10

81. The graph of $y = \frac{2x^2+2x+3}{4x^2-4x}$ has

(A) a horizontal asymptote at $y = \frac{1}{2}$ but no vertical asymptote

(B) no horizontal asymptote but two vertical asymptotes at $x = 0$ and $x = 1$

(C) a horizontal asymptote at $y = \frac{1}{2}$ and two vertical asymptotes at $x = 0$ and $x = 1$

(D) a horizontal asymptote at $x = 2$ but no vertical asymptote

(E) a horizontal asymptote at $y = \frac{1}{2}$ and two vertical asymptotes at $x = \pm 1$

82. The function $f(x) = \begin{cases} x^{2/x} & \text{for } x \neq 0 \\ 0 & \text{for } x = 0 \end{cases}$

(A) is continuous everywhere

(B) is continuous except at $x = 0$

(C) has a removable discontinuity at $x = 0$

(D) has a jump discontinuity at $x = 0$

(E) has x = 0 as a vertical asymptote

83. If $h(x) = \frac{1}{2+10^{1/x}}$, then $\lim_{x\to 0} h(x)$ is

(A) 0 (B) $\frac{1}{12}$ (C) $\frac{1}{2}$ (D) $\frac{1}{3}$ (E) nonexistent