Hopkins

AP AB Calculus

Multiple Choice Limit Problems

Years: 1969 – 2008

All of the problems in this packet come from actual released AP multiple choice exams. They all deal with limits in some form. If you are able to do *all* of these problems you should be in good shape for the exam on limits. The exam on limits will be on

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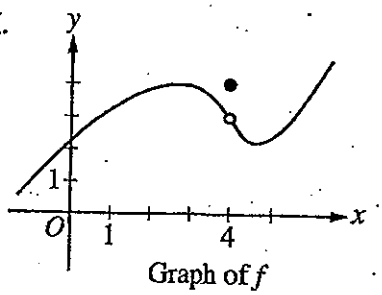
2003 AB

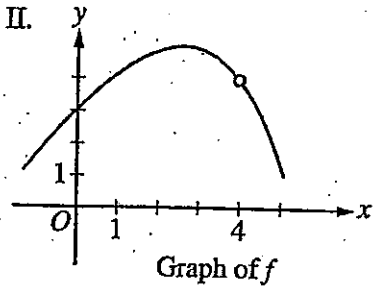
79. For which of the following does $\lim_{x \to 4} f(x)$ exist?

I.



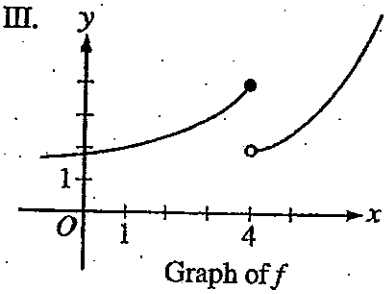
Graph of f

II.



Graph of f

III.



Graph of f

(A) I only

(B) II only

(C) III only

(D) I and II only

(E) I and III only

2008 AB

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

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

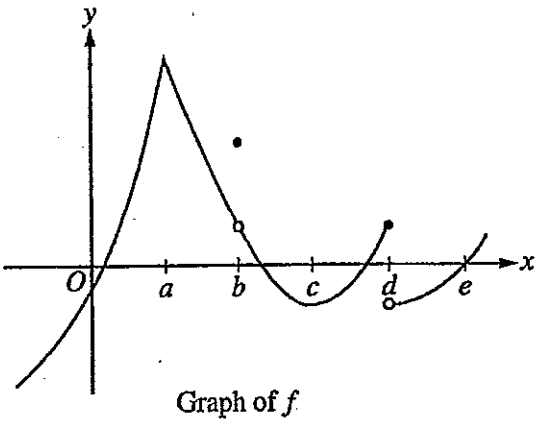
(B) II only

(C) III only

(D) I and II only

(E) I, II, and III

2003
~~2008~~
AB

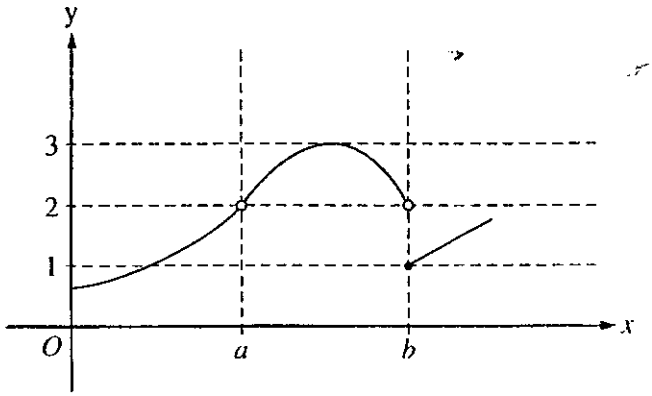


Graph of f

13. The graph of a function f is shown above. At which value of x is f continuous, but not differentiable?

(A) a (B) b (C) c (D) d (E) e

1997
AB



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

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

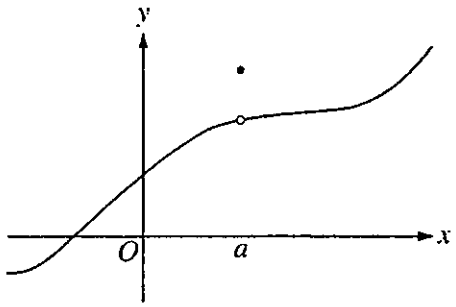
(B) $\lim_{x \to a} f(x) = 2$

(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.

1998
AB



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

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

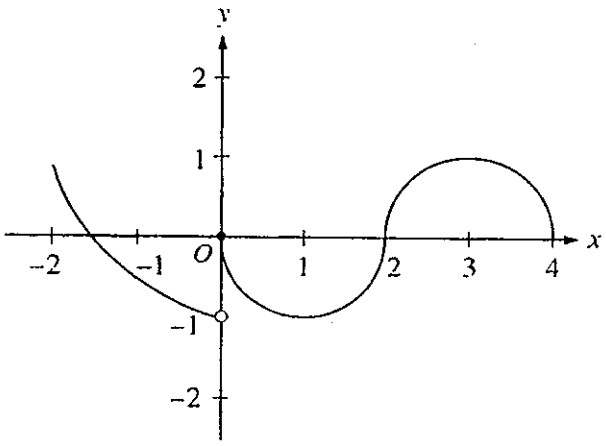
(B) f has a relative maximum at $x = a$.

(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.

1998
BC



13. The graph of the function f shown in the figure above has a vertical tangent at the point $(2,0)$ and horizontal tangents at the points $(1,-1)$ and $(3,1)$. For what values of x, $-2 < x < 4$, is f not differentiable?

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

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75 3

5. If $f(x)=e^x$, which of the following lines is an asymptote to the graph of f?

(A) $y=0$ (B) $x=0$ (C) $y=x$ (D) $y=-x$ (E) $y=1$

1993

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

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

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

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

2003 AB

1986 AB

5. $\lim_{n\to\infty}\frac{4n^2}{n^2+10{,}000n}$ is

(A) 0 (B) $\frac{1}{2{,}500}$ (C) 1 (D) 4 (E) nonexistent

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

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

2008 AB

1985 BC

38. $\lim_{x\to\infty}\left(1+5e^x\right)^{\frac{1}{x}}$ is

(A) 0 (B) 1 (C) e (D) e^5 (E) nonexistent

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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) $f(0) = 2$

2003 AB

(B) $f(x) \neq 2$ for all $x \geq 0$

(C) $f(2)$ is undefined.

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

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

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

1998 AB

(A) $\ln 2$ (B) $\ln 8$ (C) $\ln 16$ (D) 4 (E) nonexister

81. Let f be the function given by $f(x)=|x|$. Which of the following statements about f are true?

1998 AB

I. f is continuous at $x=0$.
II. f is differentiable at $x=0$.
III. f has an absolute minimum at $x=0$.

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

2003 AB

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

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

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

42. $\lim_{x\to 0}(1+2x)^{\csc x} =$

1993 BC

(A) 0 (B) 1 (C) 2 (D) e (E) e^2

1995 AB

37. $\lim_{x\to 0}(x\csc x)$ is

(A) $-\infty$ (B) -1 (C) 0 (D) 1 (E) ∞

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29. $\lim_{\theta\to 0}\dfrac{1-\cos\theta}{2\sin^2\theta}$ is

1993 AB

(A) 0 (B) $\frac{1}{8}$ (C) $\frac{1}{4}$ (D) 1 (E) nonexistent

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23. $\lim_{h\to 0}\dfrac{1}{h}\ln\left(\dfrac{2+h}{2}\right)$ is

1973 AB

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

1969 BC

28. What is $\lim_{x\to 0}\dfrac{e^{2x}-1}{\tan x}$?

(A) -1 (B) 0 (C) 1 (D) 2 (E) The limit does not exist.

1997 BC

16. $\lim_{h\to 0}\dfrac{e^h-1}{2h}$ is

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

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

2008 AB

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

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1998 BC

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

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