Worksheet #6: AP Multiple Choice Limits & Continuity

All work must be shown in this course for full credit.

2016 No Calculator

3. $\lim_{x\to\infty} \dfrac{\sqrt{9x^4+1}}{4x^2+3}$ is

(A) $\frac{1}{3}$ (B) $\frac{3}{4}$ (C) $\frac{3}{2}$ (D) $\frac{9}{4}$ (E) infinite

7. For which of the following pairs of functions f and g is $\lim_{x\to\infty} \dfrac{f(x)}{g(x)}$ infinite?

(A) $f(x) = x^2 + 2x$ and $g(x) = x^2 + \ln x$

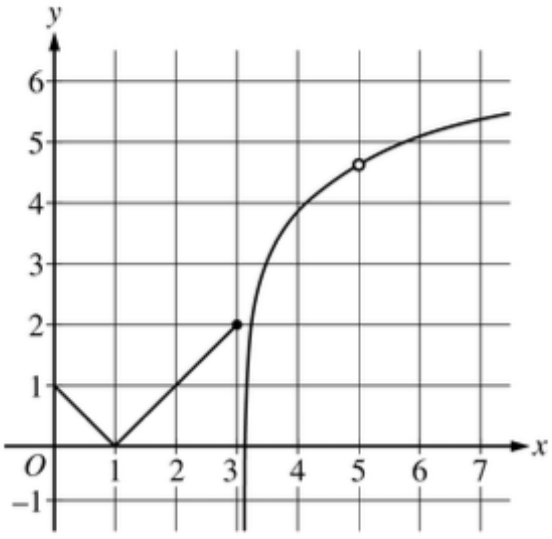
(B) $f(x) = 3x^3$ and $g(x) = x^4$

(C) $f(x) = 3^x$ and $g(x) = x^3$

(D) $f(x) = 3e^x + x^3$ and $g(x) = 2e^x + x^2$

(E) $f(x) = \ln(3x)$ and $g(x) = \ln(2x)$

2016 Calculator



Graph of f

76. The graph of a function f is shown above. Which of the following limits does not exist?

(A) $\lim_{x\to 1^-} f(x)$ (B) $\lim_{x\to 1} f(x)$ (C) $\lim_{x\to 3^-} f(x)$ (D) $\lim_{x\to 3} f(x)$ (E) $\lim_{x\to 5} f(x)$

77. Let f be a function that is continuous on the closed interval $[1, 3]$ with $f(1) = 10$ and $f(3) = 18$. Which of the following statements must be true?

(A) $10 \le f(2) \le 18$

(B) f is increasing on the interval $[1, 3]$.

(C) $f(x) = 17$ has at least one solution in the interval $[1, 3]$.

(D) $f'(x) = 8$ has at least one solution in the interval $(1, 3)$.

(E) $\int_1^3 f(x)dx > 20$

82. If f is a continuous function such that $f(2) = 6$, which of the following statements must be true?

(A) $\lim_{x\to 1} f(2x) = 3$

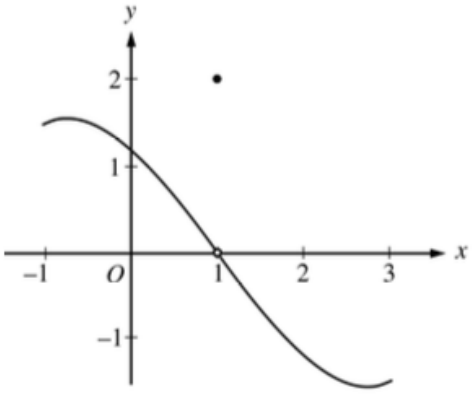
(B) $\lim_{x\to 2} f(2x) = 12$

(C) $\lim_{x\to 2} \dfrac{f(x) - f(2)}{x - 2} = 6$

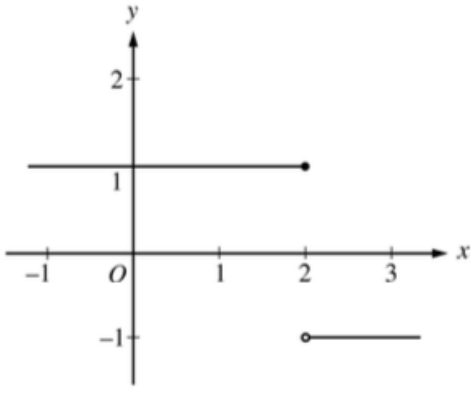
(D) $\lim_{x\to 2} f\left(x^2\right) = 36$

(E) $\lim_{x\to 2} (f(x))^2 = 36$

2017 No Calculator



Graph of f



Graph of g

15. The graphs of the functions f and g are shown in the figures above. Which of the following statements is false?

(A) $\lim_{x\to 1} f(x) = 0$

(B) $\lim_{x\to 2} g(x)$ does not exist.

(C) $\lim_{x\to 1} (f(x)g(x+1))$ does not exist.

(D) $\lim_{x\to 1} (f(x+1)g(x))$ exists.

20. Let f be the function given by $f(x) = \dfrac{x-2}{2|x-2|}$. Which of the following is true?

(A) $\lim\limits_{x\to 2} f(x) = \dfrac{1}{2}$

(B) f has a removable discontinuity at $x = 2$.

(C) f has a jump discontinuity at $x = 2$.

(D) f has a discontinuity due to a vertical asymptote at $x = 2$.

2017 Calculator

78. The continuous function f is positive and has domain $x > 0$. If the asymptotes of the graph of f are $x = 0$ and $y = 2$, which of the following statements must be true?

(A) $\lim\limits_{x\to 0^+} f(x) = \infty$ and $\lim\limits_{x\to 2} f(x) = \infty$

(B) $\lim\limits_{x\to 0^+} f(x) = 2$ and $\lim\limits_{x\to \infty} f(x) = 0$

(C) $\lim\limits_{x\to 0^+} f(x) = \infty$ and $\lim\limits_{x\to \infty} f(x) = 2$

(D) $\lim\limits_{x\to 2} f(x) = \infty$ and $\lim\limits_{x\to \infty} f(x) = 2$

2003 No Calculator

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) $\lim\limits_{x\to 2} f(x) = \infty$

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

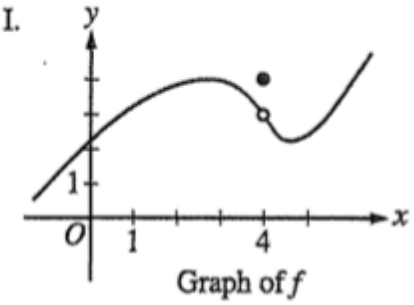
6. $\lim\limits_{x\to\infty} \dfrac{x^3 - 2x^2 + 3x - 4}{4x^3 - 3x^2 + 2x - 1} =$

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

2003 Calculator

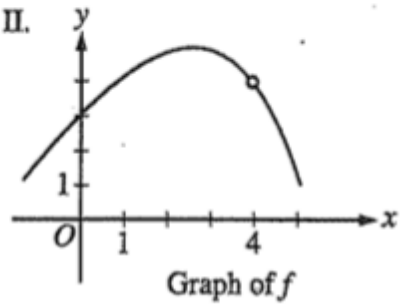
79. For which of the following does $\lim_{x \to 4} f(x)$ exist?

I.



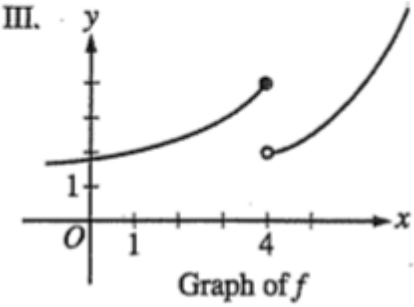
Graph of f

II.



Graph of f

III.



Graph of f

(A) I only

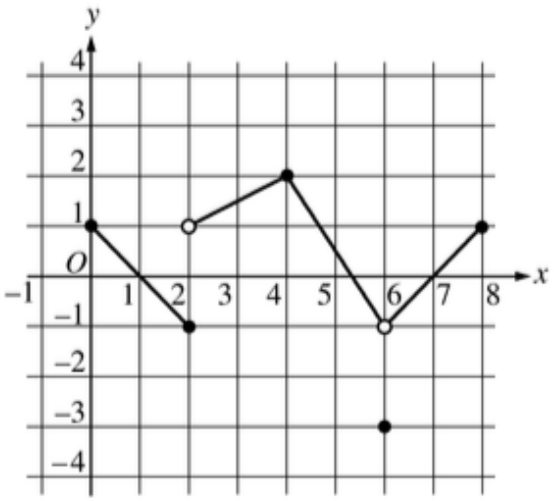
(B) II only

(C) III only

(D) I and II only

(E) I and III only

2014 No Calculator



5. The figure above shows the graph of the function f. Which of the following statements are true?

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

II. $\lim_{x \to 6^-} f(x) = \lim_{x \to 6^+} f(x)$

III. $\lim_{x \to 6} f(x) = f(6)$

(A) II only

(B) III only

(C) I and II only

(D) II and III only

(E) I, II, and III

7. $\lim_{x\to\infty} \frac{x^3}{e^{3x}}$ is

(A) 0 (B) $\frac{2}{9}$ (C) $\frac{2}{3}$ (D) 1 (E) infinite

$$f(x) = \begin{cases} \dfrac{x^2 - 7x + 10}{b(x-2)} & \text{for } x \neq 2 \\ b & \text{for } x = 2 \end{cases}$$

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

(A) -3 (B) $\sqrt{2}$ (C) 3 (D) 5 (E) There is no such value of b.

16. $\lim_{x\to 3^-} \frac{|x-3|}{x-3}$ is

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

24. Let f be the function defined by $f(x) = \frac{(3x+8)(5-4x)}{(2x+1)^2}$. Which of the following is a horizontal asymptote to the graph of f?

(A) $y = -6$

(B) $y = -3$

(C) $y = -\frac{1}{2}$

(D) $y = 0$

(E) $y = \frac{3}{2}$