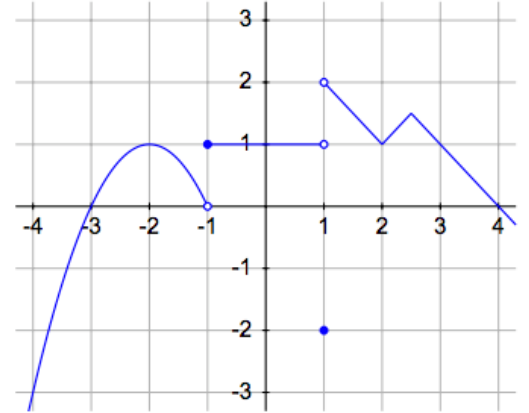


AP Calculus TEST: 1.1-1.4—Limits and Continuity. No Calculator. BC

Part I: Multiple Choice—write the CAPITAL LETTER in the blank to the left of the problem number.

Use the graph of the function $f(x)$ shown at right to answer questions 1.



_____ 1. $\lim_{x \rightarrow -2^+} f(f(x)) =$
 (A) 1 (B) 2 (C) -2 (D) 0 (E) No such value exists

_____ 2. $\lim_{x \rightarrow 0} \frac{(2+x)^2 + 3(2+x) - 10}{x} =$
 (A) -3 (B) 0 (C) 7 (D) 9 (E) No such value exists

_____ 3. $\lim_{x \rightarrow -3^-} \frac{(x+1)(x+4)}{(x+3)(x+1)} =$
 (A) ∞ (B) $-\infty$ (C) $\frac{7}{18}$ (D) $\frac{4}{3}$ (E) 1

_____ 4. $f(x) = \begin{cases} 3x+10, & x < -2 \\ \frac{2x}{x+1}, & -2 \leq x < 1 \\ \sqrt{x-1}, & x \geq 1 \end{cases}$

Let $f(x)$ be defined by the piecewise equation above, then $f(x)$ is continuous

- (A) for all $x \neq -2, -1$ (B) for all $x \neq -1$ (C) for all $x \neq 1$ (D) for all $x \neq -2, 1$ (E) for all $x \neq -1, 1$

_____ 5. $\lim_{x \rightarrow 1} \frac{\frac{2}{x+3} - \frac{1}{2}}{x-1} =$ (A) $-\frac{1}{8}$ (B) $\frac{1}{8}$ (C) DNE (D) $\frac{1}{6}$ (E) $-\frac{1}{6}$

_____ 6. Evaluate $\lim_{x \rightarrow 0} \left(\frac{4 \tan 3x}{3 \tan 4x} - \frac{\cos 2x - 1}{2x} + \frac{\sin 6x}{3x} + \sec x \right) =$ (A) 0 (B) 1 (C) 2 (D) 3 (E) 4

_____ 7. If $f(x) = \begin{cases} \frac{\sqrt{x-2}-2}{x-6}, & x \neq 6 \\ k, & x = 6 \end{cases}$, find the value of k that makes $f(x)$ continuous at $x = 6$.

- (A) 1 (B) $\frac{1}{4}$ (C) $\frac{1}{2}$ (D) $\frac{1}{8}$ (E) $\frac{1}{6}$

_____ 8. $\lim_{x \rightarrow -1} \frac{x^3 - 3x^2 - 3x + 1}{x^2 - x - 2} =$

- (A) $-\frac{2}{3}$ (B) $-\frac{4}{3}$ (C) ∞ (D) 4 (E) -2

_____ 9. The function $g(x) = \frac{3x^3 - x^2 + 4x - 5}{x^2 + 2x - 2}$ has an end behavior asymptote of which of the following?

- (A) $y = 3$ (B) $y = -3$ (C) $y = 3x$ (D) $y = 3x + 5$ (E) $y = 3x - 7$

Part II: Free Response: Show all work in the space provided. Be sure to use proper notation, notation, notation. No notation, No no points!!!

$$\text{Let } f(x) = \begin{cases} \frac{-2x^3 - 5x^2 + 4x - 9}{\sqrt{10x^6 + 7x^4 + 8x^2 + 1}}, & x \leq -100 \\ \frac{(3+x)^2 - 3(3+x) - 28}{x+7}, & -100 < x \leq -5 \\ \frac{5x^3}{\sin^3 2x}, & -5 < x \leq 1 \\ bx^2 + a, & 1 < x < 2 \\ 7, & x = 2 \\ 5bx - a, & 2 < x < 7 \\ \sqrt{x+2}, & 7 \leq x < 14 \\ \frac{1}{2}x - 2, & x \geq 14 \end{cases}$$

(a) Find $\lim_{x \rightarrow -7} f(x)$

(b) Find $\lim_{x \rightarrow -\infty} f(x)$

(c) $\lim_{x \rightarrow 0} f(x) =$

(d) Find the values of a and b that make f continuous at $x = 2$. Show all steps, and use correct notation, notation, notation.

(e) Using the 3-step definition of continuity at a point, determine if $f(x)$ is continuous at $x = 14$. Justify.