

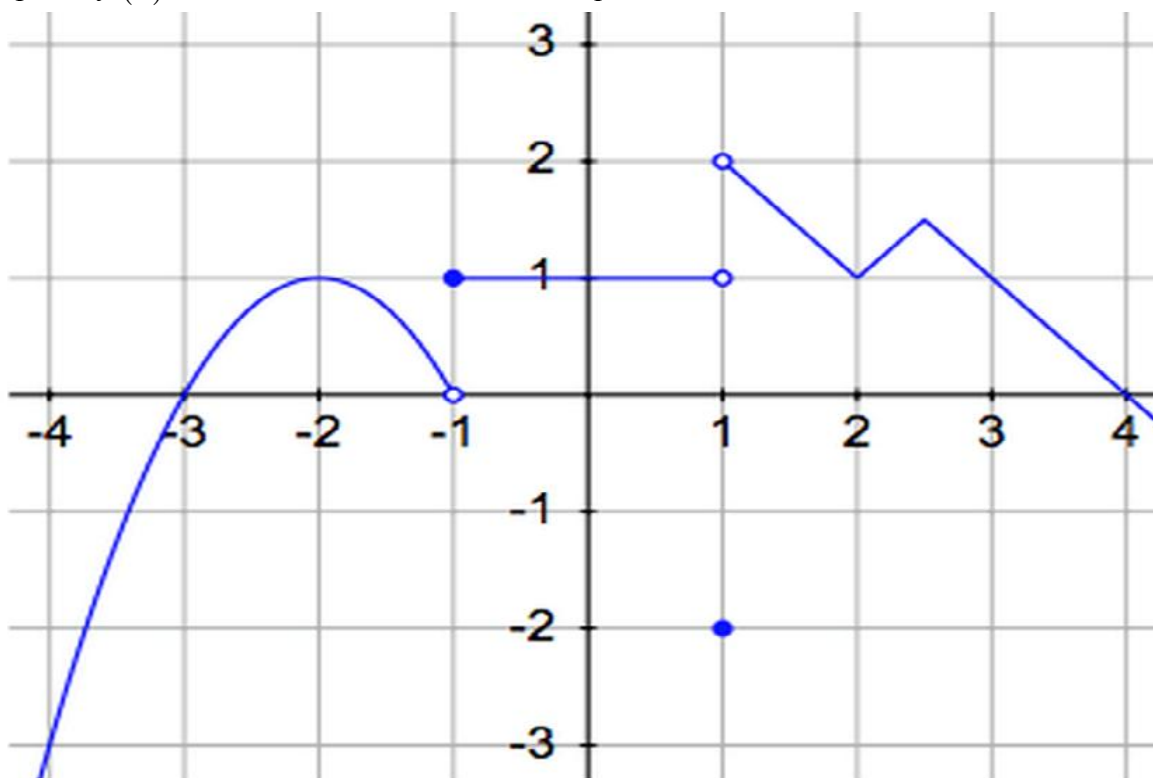
Name KEY 19 points total Date _____ Period _____

PreAP Precalculus

TEST Chapter 2.1-2.3, Form A. No Calculator

Part I: Multiple Choice, Put your **CAPITAL LETTER** answer choice in the blank to the left of the number.

Use the graph of $f(x)$ below for $-4 \leq x \leq 4$ to answer questions 1- 5.



E 1. $\lim_{x \rightarrow 1} f(x) =$ $\lim_{x \rightarrow 1^-} f(x) = 1 \neq 2 = \lim_{x \rightarrow 1^+} f(x)$
 (A) -1 (B) 0 (C) 1 (D) 2 (E) DNE

D 2. $f(x)$ is monotonic/strictly decreasing on which of the following given intervals?
 (A) $(-3, -2)$ (B) $(-1, 1)$ (C) $(2, 3)$ (D) $(1, 2)$ (E) $(2, 4)$

B 3. $\lim_{x \rightarrow -1^-} f(x) =$
 (A) -1 (B) 0 (C) 2 (D) DNE (E) $-\infty$

A 4. $f(x)$ has a relative/local minimum of $y =$
 (A) 1 (B) -1 (C) 3 (D) 4 (E) $f(x)$ has no relative/local minimum

D 5. Which of the following is **NOT** true about the graph of $f(x)$?
 (A) $f(x)$ has a jump discontinuity at $x = -1$ (B) $\lim_{x \rightarrow 0^-} f(x) = f(0) = \lim_{x \rightarrow 0^+} f(x)$ (C) $f(1)$ exists
 (D) $f(x)$ is an odd function (E) $f(x)$ has a local max at $x = -2$.

A 6. If $h(x) = 3\sqrt{x-1}$, find the average rate of change of $h(x)$ on the interval $x \in [17, 37]$.

- (A) $\frac{3}{10}$ (B) $-\frac{3}{10}$ (C) $\frac{10}{3}$ (D) $-\frac{10}{3}$ (E) $\frac{1}{10}$

$$\begin{aligned} \text{Avg} &= \frac{h(37) - h(17)}{37 - 17} \\ &= \frac{18 - 12}{20} \\ &= \frac{6}{20} = \frac{3}{10} \end{aligned}$$

C 7. $\lim_{x \rightarrow \infty} \frac{8888x^{88} + 88x^8 - 88888}{1111x^{88} + 111x^{11} - 11x^{111}} = 0$

- (A) 8 (B) 8888 (C) 0 (D) $-\infty$ (E) ∞

C 8. Which of the following **is true** about $f(x) = \frac{3x^2 - 5x - 2}{x^2 - 2x} = \frac{(x-2)(3x+1)}{x(x-2)} = \frac{3x+1}{x}, x \neq 2$

- (A) $f(x)$ has a vertical asymptote at $x = 2$ (B) $f(x)$ is an even function (C) $\lim_{x \rightarrow -\infty} f(x) = 3$

- (D) $f(x)$ has a hole at $(2, \frac{5}{2})$ (E) $f(x)$ has an x-intercept at $x = \frac{1}{3}$

$$(2, \frac{7}{2}) \quad \frac{7}{2} \neq \frac{5}{2}$$

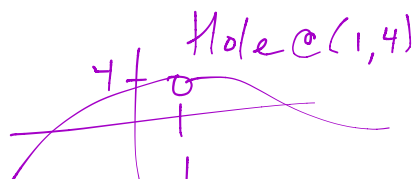
B 9. The function $f(x) = \begin{cases} 5x - 1, & x < 1 \\ x^2 + 3, & x > 1 \end{cases}$ $x \neq 1$

- (A) has a jump at $x = 1$ (B) has a hole at $x = 1$ (C) has a VA at $x = 1$
(D) is continuous at $x = 1$ (E) is an even function

$$\lim_{x \rightarrow 1^-} f(x) = 5(1) - 1 = 4$$

$$\lim_{x \rightarrow 1^+} f(x) = 1^2 + 3 = 4$$

$$f(1) = \text{DNE}$$



Part II: Free Response

Show all work in the space provided. As always, use proper notation, and show the work that leads to your answer. Remember that on this section, your **PROCESS** is as important as your **PRODUCT**.

10. Given $f(x) = \frac{x^3 + 5x^2 - 24x}{x^3 + 11x^2 + 24x}$

(a) What is the **equation** of the Horizontal Asymptote?

$y = 1$ ✓₁

(b) Is $f(x)$ even, odd, or neither? Justify by showing the algebraic test with result.

$$f(-x) = \frac{(-x)^3 + 5(-x)^2 - 24(-x)}{(-x)^3 + 11(-x)^2 + 24(-x)} = \frac{-x^3 + 5x^2 + 24x}{-x^3 + 11x^2 - 24x} \rightarrow N = N$$

So $f(x)$ is neither even nor odd ✓₂

(c) Factor both the numerator and denominator completely.

$$\begin{aligned} f(x) &= \frac{x^3 + 5x^2 - 24x}{x^3 + 11x^2 + 24x} \\ &= \frac{x(x^2 + 5x - 24)}{x(x^2 + 11x + 24)} \\ &= \frac{x(x+8)(x-3)}{x(x+8)(x+3)} \end{aligned}$$

✓₃

(d) Find the domain of $f(x)$.

$D_f: \{x \mid x \neq 0, -8, -3\}$ ✓₄

(e) Find the **equation** of any Vertical Asymptotes.

$$f(x) = \frac{x(x+8)(x-3)}{x(x+8)(x+3)} = \frac{x-3}{x+3}, x \neq 0, -8$$

VA @ $x = -3$ ✓₅

(f) Find the **coordinate(s)** (x, y) of any and all holes/removable point discontinuities.

holes @ $(0, -1)$ and $(-8, \frac{11}{5})$
 $\sqrt{6}$ $\sqrt{7}$

(g) Find the **coordinate** (x, y) of any x-intercept. Show the work that leads to your answer.

$$f(x) = \frac{x-3}{x+3}, x \neq 0, -8$$

$$f(x) = 0$$

at $x = 3$ at $(3, 0)$ $\sqrt{8}$

(h) Find the **coordinate** (x, y) of any y-intercept. Show the work that leads to your answer.

No y-intercept, hole at $(0, -1)$
 $\sqrt{9}$

(i) Sketch a graph of $f(x)$ showing all the above information.

