AP Calculus Quiz #3
Part #1 - No Calculator

Student Name: **Period:** **Date:**

For problems 1 - 7, find the limit.

1) $\lim_{x \to 1^-} \frac{1}{x-1} =$ ________

2) $\lim_{x \to 1^+} \frac{1}{x-1} =$ ________

3) $\lim_{x \to 1} \frac{1}{x-1} =$ ________

4) $\lim_{x \to 3^+} \frac{|x-3|}{x-3} =$ ________

5) $\lim_{x \to 0^+} \left(1 + \frac{1}{x}\right) =$ ________

6) $\lim_{x \to 3} \frac{x}{(3-x)^2} =$ ________

7) $\lim_{x \to 0} \frac{3\sin^2 x}{x^2} =$ ________

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8. What is $\lim_{x \to \infty} \frac{x^2 - 4}{2 + x - 4x^2}$?

(A) -1 (B) $-\frac{1}{4}$ (C) $\frac{1}{2}$ (D) 1 (E) The limits does not exist.

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9. What is $\lim_{x \to 3} \frac{x^2 - x - 6}{x - 3}$?

(A) 1 (B) 2 (C) 5 (D) 0 (E) The limits does not exist.

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10. Let f be defined as follows, where $a \neq 0$.

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

Which of the following are true about f?

I. $\lim_{x \to a} f(x)$ exists   II. $f(a)$ exists   III. $f(x)$ is continuous at $x = a$.

(A) None   (B) I only   (C) II only   (D) I and II only   (E) I, II, and III

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11. Given $f(x) = \begin{cases} \dfrac{x^2 - 3x + 2}{x - 2}, & \text{for } x \neq 2 \\ a & \text{for } x = 2 \end{cases}$. If f is continuous at $x = 2$, then $a =$

(A) –2   (B) –1   (C) 0   (D) 1   (E) 2

AP Calculus Quiz #3
Part #2 - Calculator

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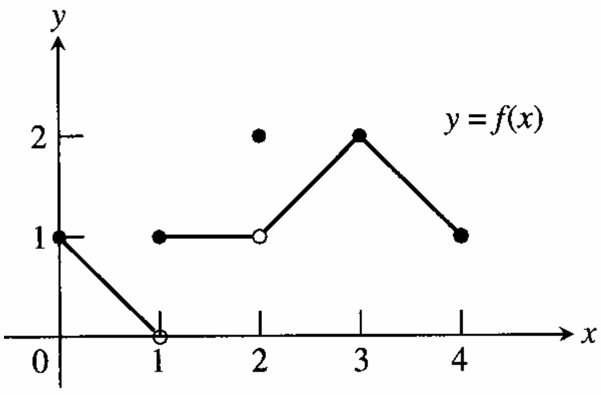
*Questions **12 through 16** are about the function f shown in the graph defined below:*



$$f(x) = \begin{cases} -x+1, & 0 \le x < 1 \\ 1, & 1 \le x < 2 \\ 2, & x = 2 \\ x-1, & 2 < x \le 3 \\ -x+5, & 3 < x \le 4. \end{cases}$$

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12. $\lim_{x \to 2} f(x)$ is

(A) 0 (B) 1 (C) 2 (D) does not exist (E) none of these

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13. The function *f* is defined on [0, 4]

(A) except at $x = 0$ (B) except at $x = 1$ (C) except at $x = 2$

(D) except at $x = 3$ (E) at each *x* in [–1,3].

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14. The function has removable discontinuity at

(A) $x = 0$ (B) $x = 1$ (C) $x = 2$ (D) $x = 3$ (E) none of these

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15. On which of the following intervals is *f* continuous?

(A) $0 \le x \le 1$ (B) $0 < x < 1$ (C) $1 \le x \le 2$

(D) $2 < x \le 4$ (E) none of these

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16. The function has a jump discontinuity at

(A) $x = 0$ (B) $x = 1$ (C) $x = 2$ (D) $x = 3$ (E) none of these

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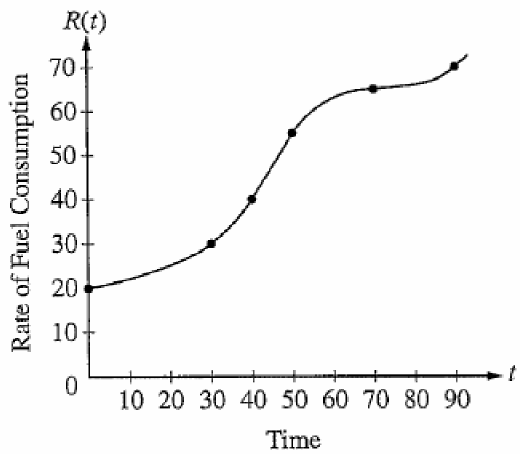
17.



t (minutes)	$R(t)$ (gallons per minute)
0	20
30	30
40	40
50	55
70	65
90	70

The rate of fuel consumption, in gallons per minute, recorded during an airplane flight is given by a twice-differentiable and strictly increasing function R of time t. The graph of R and a table of selected values of $R(t)$, for the time interval $0 \le t \le 90$ minutes, are shown above.

(a) Find the average rate of fuel consumption for first 90 minutes of flight. Show your work.

(b) During what time interval is the rate of fuel consumption changing the fastest? Explain.

(c) Use data from the table to find an approximation for $R'(45)$. Show the computations that lead to your answer. Indicate units of measure.

Bonus: Identify the behavior of the graph of g(x) for each set of conditions and sketch a graph of the function $g(x)$ that will meet all of those conditions.

a. $\lim_{x \to 0^-} g(x) = -2$ and $\lim_{x \to 0^+} g(x) = -2$ and $f(0)$ does not exist.

b. $\lim_{x \to 1} g(x) = -1$ and $g(1) = -1$

c. $\lim_{x \to 2^-} g(x) = 0$ and $\lim_{x \to 2^+} g(x) = 1$ and $g(2) = 1$

d. $\lim_{x \to 3^-} g(x) = +\infty$ and $\lim_{x \to 3^+} g(x) = -\infty$ and $g(3)$ does not exist.

e. $g(4) = 0$ and $\lim_{x \to 4} g(x) = -1$

f. $\lim_{x \to -\infty} g(x) = 0$

g. $\lim_{x \to \infty} g(x) = -\infty$