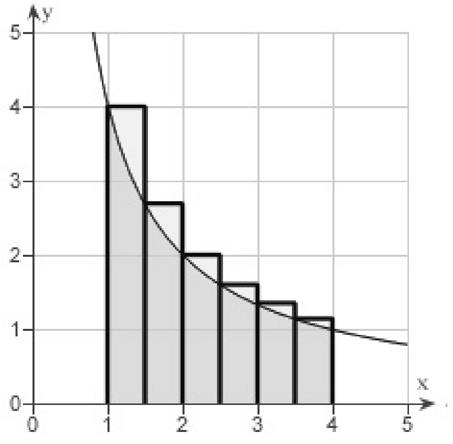
AP Calculus
Chapter 1 Test

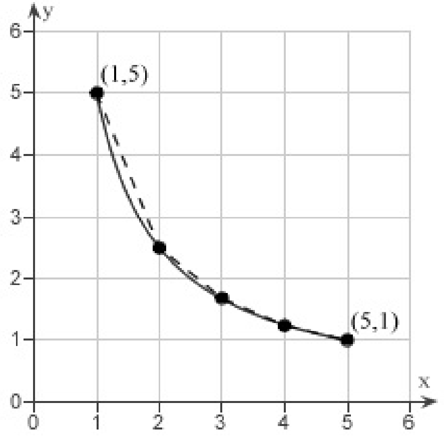
Multiple Choice
Identify the choice that best completes the statement or answers the question. To receive full credit, please SHOW ALL WORK. ☺

____ 1. Use the rectangles in the graph given below to approximate the area of the region bounded by $y = 4/x, y = 0, x = 1,$ and $x = 4$ Round your answer to three decimal places.



a. 2.481 units^2
b. 6.500 units^2
c. 3.585 units^2
d. 7.872 units^2
e. 6.903 units^2

______ 2. Consider the length of the graph of $f(x) = 5/x$ from $(1, 5)$ to $(5, 1)$ Approximate the length of the curve by finding the sum of the lengths of four line segments, as shown in following figure. Round your answer to two decimal places.



a. 6.05
b. 8.12
c. 5.66
d. 8.49
e. 7.11

_____ 3. Complete the table and use the result to estimate the limit.

$$\lim_{x \to 3} \frac{x-3}{x^2 - 16x + 39}$$

x	2.9	2.99	2.999	3.001	3.01	3.1
$f(x)$						

a. 0.525000
b. 0.275000
c. –0.100000
d. 0.400000
e. –0.475000

_____ 4. Complete the table and use the result to estimate the limit.

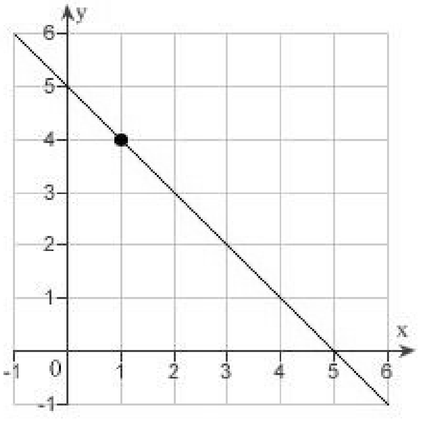
$$\lim_{x \to 0} \frac{\cos(3x) - 1}{3x}$$

x	–0.1	–0.01	–0.001	0.001	0.01	0.1
$f(x)$						

a. -1
b. -0.5
c. 0
d. 0.5
e. 1

_____ 5. Determine the following limit. (Hint: Use the graph to calculate the limit.)

$$\lim_{x \to 1} (5 - x)$$

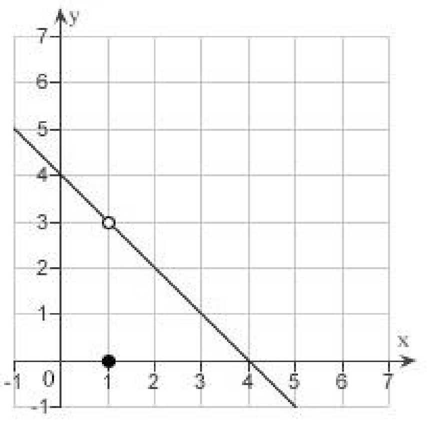


a. 6
b. 1
c. 5
d. 4
e. does not exist

____ 6. Let $f(x) = \begin{cases} 4 - x, & x \neq 1 \\ 0, & x = 1 \end{cases}$.

Determine the following limit. (Hint: Use the graph to calculate the limit.)

$\lim\limits_{x \to 1} f(x)$

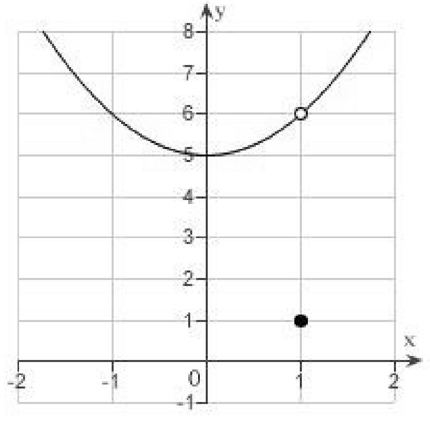


a. 5
b. 4
c. 3
d. 0
e. does not exist

____ 7. Let $f(x) = \begin{cases} x^2 + 5, & x \neq 1 \\ 1, & x = 1 \end{cases}$.

Determine the following limit. (Hint: Use the graph to calculate the limit.)

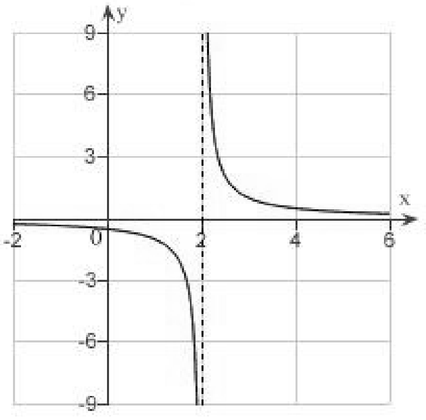
$\lim\limits_{x \to 1} f(x)$



a. 6
b. 25
c. 1
d. 5
e. does not exist.

____ 8. Determine the following limit. (Hint: Use the graph to calculate the limit.)

$$\lim_{x \to 2} \frac{1}{x-2}$$



a. –2
b. 0
c. –4
d. 2
e. does not exist

____ 9. Find the limit.

$$\lim_{x \to \pi} \tan\left(\frac{x}{3}\right)$$

a. $\frac{-1}{\sqrt{3}}$

b. $\sqrt{3}$

c. $-\sqrt{3}$

d. $\frac{1}{\sqrt{3}}$

____ 10. Find the following limit (if it exists). Write a simpler function that agrees with the given function at all but one point.

$$\lim_{x \to -4} \frac{8x^2 + 40x + 32}{x + 4}$$

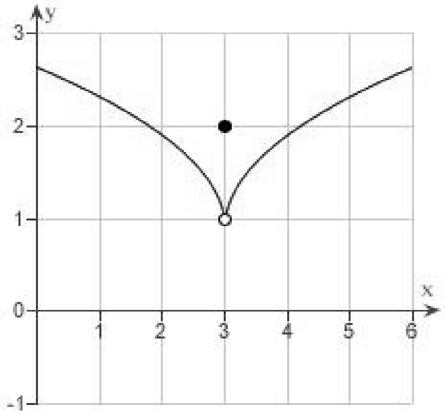
a. 40
b. –24
c. 24
d. –40
e. does not exist

____ 11. Find $\lim_{\Delta x \to 0} \dfrac{f(x + \Delta x) - f(x)}{\Delta x}$ where $f(x) = 4x - 2$.

a. 1
b. 4
c. –3
d. 0
e. Limit does not exist.

____ 12. Use the graph as shown to determine the following limits, and discuss the continuity of the function at $x = 3$.

(i) $\lim_{x \to 3^+} f(x)$ (ii) $\lim_{x \to 3^-} f(x)$ (iii) $\lim_{x \to 3} f(x)$



a. 1 , 1 , 1 , not continuous
b. 2 , 2 , 2 , continuous
c. 4 , 4 , 4 , not continuous
d. 2 , 2 , 2 , not continuous
e. 1 , 1 , 1 , continuous

____ 13. Find the limit (if it exists). You may use your calculator to help you, but please show this analytically as well.

$$\lim_{x \to 11^+} \frac{11 - x}{x^2 - 121}$$

a. $\frac{1}{22}$

b. 0

c. Limit does not exist.

d. $-\frac{1}{22}$

e. $\frac{1}{242}$

____ 14. Find the limit (if it exists). You may use your calculator to help you, but please show this analytically as well.

$$\lim_{x \to 36^-} \frac{\sqrt{x} - 6}{x - 36}$$

a. 0

b. $-\frac{1}{12}$

c. $\frac{1}{72}$

d. $\frac{1}{12}$

e. Limit does not exist.

____ 15. Find the *x*-values (if any) at which the function $f(x) = 13x^2 - 15x - 15$ is not continuous. Which of the discontinuities are removable?

a. $x = 4$, removable

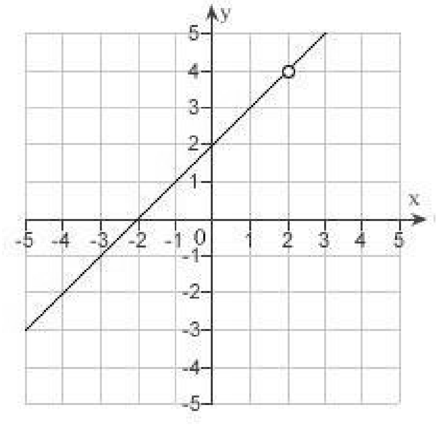
b. $x = 0$, removable

c. $x = \frac{15}{26}$, not removable.

d. continuous everywhere

e. $x = \frac{15}{26}$, removable.

____ 16. Discuss the continuity of the function $f(x) = \frac{x^2 - 4}{x - 2}$.



a. $f(x)$ is discontinuous at $x = -2$.
b. $f(x)$ is discontinuous at $x = -2, 2$.
c. $f(x)$ is discontinuous at $x = 2$.
d. $f(x)$ is continuous for all real x.
e. $f(x)$ is continuous at $x = 4$.

____ 17. Find the *x*-values (if any) at which the function $f(x) = \frac{x + 2}{x^2 + 6x + 8}$ is not continuous. Which of the discontinuities are removable? You may use your calculator to help you, but please show this analytically as well.

a. no points of discontinuity
b. $x = -2$ (not removable), $x = -4$ (removable)
c. $x = -2$ (removable), $x = -4$ (not removable)
d. no points of continuity
e. $x = -2$ (not removable), $x = -4$ (not removable)

____ 18. Find all vertical asymptotes (if any) of the function $f(x) = \frac{x^2 + 4x + 3}{x^3 - 4x^2 - x + 4}$. You may use your calculator to help you, but please show this analytically as well.

a. $x = 4, 1$
b. $x = 4,\ 1,\ -1$
c. $x = -4, -1$
d. $x = 3$
e. $x = -3$

____ 19. Find the limit. You may use your calculator to help you, but please show this analytically as well.

$$\lim_{x \to -10} \frac{x^2 + 10x}{\left(x^2 + 100\right)(x + 10)}$$

a. $\frac{1}{20}$
b. $-\frac{1}{20}$
c. 20
d. -10
e. -20

____ 20. Find the limit. You may use your calculator to help you, but please show this analytically as well.

$$\lim_{x \to 0^-} \left(x^2 - \frac{1}{x}\right)$$

0
a. 0
b. -1
c. $-\infty$
d. ∞
e.

Bonus: Find the limits. You may use your calculator to help you, but please show this analytically as well.

1. $$\lim_{x \to 1} \frac{\frac{1}{\sqrt{x}} - 1}{x - 1}$$

2. $$\lim_{\theta \to 0} \frac{\theta^2 + 2\theta}{\sin 2\theta}$$

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