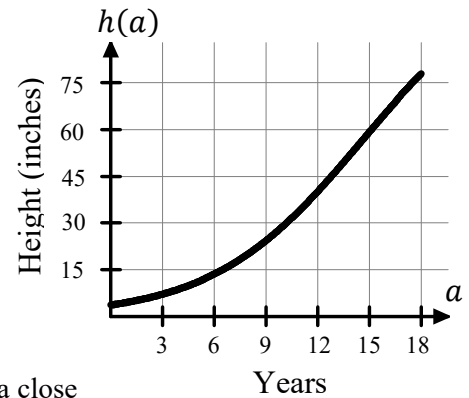


Name: _____ Date: _____

Mid-Unit 1 Corrective Assignment – Limits and Continuity

A child's height can be modeled by the function h , where $h(a)$ gives the height in inches and a gives the child's age in years for $0 \leq a \leq 18$. The graph of the function h is shown to the right.



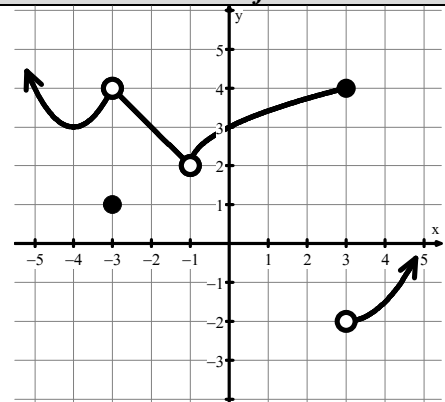
1. Draw a tangent line at $a = 9$.
2. Give a rough estimate of the instantaneous rate of change at $a = 9$.
3. Give an example of how to calculate a rate of change that would give a close estimate to the rate of change for $a = 17$.

A house loan is being paid off each month. The interest being paid each month m can be modeled by I , where $I(m)$ is the interest payment and m is the month for $0 \leq m \leq 360$.

- | | | |
|--------------------------------|---|---|
| 4. What does $I(3)$ represent? | 5. What does $\frac{I(3)-I(1)}{3-1}$ represent? | 6. What does $\frac{I(4)-I(3.999)}{4-3.999}$ represent? |
|--------------------------------|---|---|

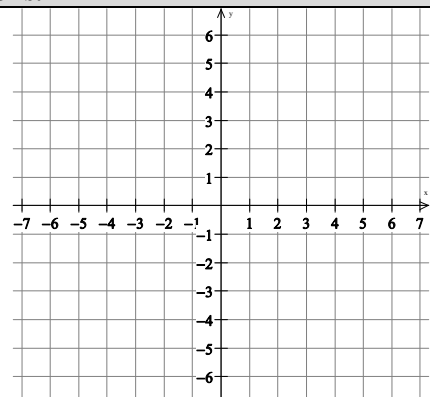
Give the value of each statement. If the value does not exist, write "does not exist" or "undefined."

- 7.
- | | | |
|--------------------------------------|------------------------------------|--------------------------------------|
| a. $\lim_{x \rightarrow 3^-} f(x) =$ | b. $f(-1) =$ | c. $\lim_{x \rightarrow -3} f(x) =$ |
| d. $\lim_{x \rightarrow -1} f(x) =$ | e. $f(-3) =$ | f. $\lim_{x \rightarrow 3^+} f(x) =$ |
| g. $f(3) =$ | h. $\lim_{x \rightarrow 0} f(x) =$ | i. $f(-4) =$ |



Sketch a graph of a function h that satisfies all of the following conditions.

- 8.
- $\lim_{x \rightarrow 3} h(x) = h(-2) = 1$
 - h is constant on $-2 < x < 3$ and decreasing everywhere else.
 - $h(3)$ is undefined.
 - $\lim_{x \rightarrow -2^-} h(x) < \lim_{x \rightarrow -2^+} h(x)$



9. According to the table, what is value of $\lim_{x \rightarrow -3} f(x)$?

x	-3.4	-3.001	-2.999	-2.7
$f(x)$	7.7	7.999	8.001	8.18

10. If $f(x) = \begin{cases} x^2 - 1, & x \leq 1 \\ \ln x & 1 < x \leq e, \\ \sqrt{x}, & x > e \end{cases}$, find the following:

a. $\lim_{x \rightarrow e^-} f(x) =$

b. $\lim_{x \rightarrow 1} f(x) =$

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

d. $f(e) =$

Evaluate the limit.

11. $\lim_{x \rightarrow 1} \frac{x^2 - 2x - 15}{x + 3}$

12. $\lim_{x \rightarrow 2} \frac{x^2 + 2x - 8}{x - 2}$

13. $\lim_{x \rightarrow -2} \frac{x + 2}{x^2 - 4}$

14. $\lim_{x \rightarrow 0} \frac{1 - \cos(2x)}{5x}$

15. $\lim_{x \rightarrow 2} \frac{\sqrt{x+2} - 2}{x - 2}$

16. $\lim_{x \rightarrow 0} \frac{\frac{1}{x+8} - \frac{1}{8}}{x}$

17. $\lim_{x \rightarrow -4^+} \frac{|x+4|}{x+4}$

18. Let f be a function where $\lim_{x \rightarrow 5} f(x) = 6$. Which of the following could represent the function f ?

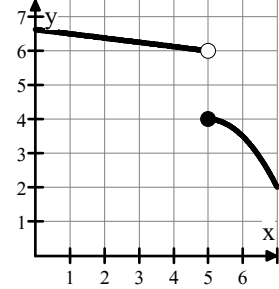
I.

$$f(x) = \begin{cases} \frac{x^2 - 4x - 5}{x - 5}, & x \neq 5 \\ 1, & x = 5 \end{cases}$$

II.

x	4.8	4.9	4.999	5	5.001	5.1	5.2
$f(x)$	6.2	6.1	6.001	-2	5.999	5.9	5.8

III.



- (A) I only (B) II only (C) III only (D) I and II only (E) I and III only

19. If f is a piecewise linear function such that $\lim_{x \rightarrow 9} f(x)$ does not exist, which of the following could be representative of the function f ?

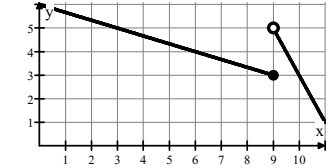
I.

$$f(x) = \begin{cases} 2x - 1, & x < 9 \\ \frac{1}{3}x + 14, & x > 9 \end{cases}$$

II.

x	6	7	8	9	10	11	12
$f(x)$	3	$\frac{10}{3}$	$\frac{11}{3}$	-3	8	12	16

III.



- (A) I only (B) II only (C) III only (D) I and III only (E) none

20. Let f and g be the functions defined by $f(x) = \frac{8 - 8 \cos x}{x^2}$ and $g(x) = x^2 \cos\left(\frac{1}{x}\right)$ for $x \neq 0$. The following inequalities are true for $x \neq 0$. State whether each inequality can be used with the squeeze theorem to find the limit of the function as x approaches 0?

- I. $4 - x^2 \leq f(x) \leq 4$ II. $-x^2 - 1 \leq g(x) \leq 1 + x^2$ III. $-x^2 \leq g(x) \leq x^2$

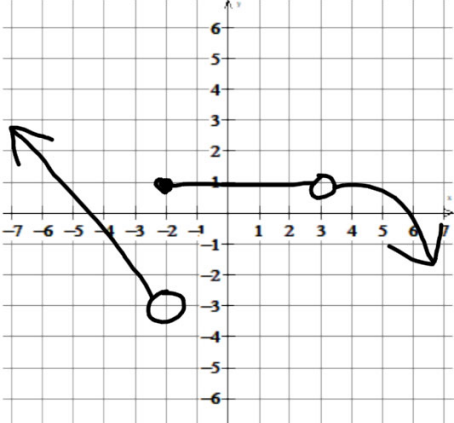
- (A) I only (B) II only (C) III only (D) I and II only (E) I and III only

21. The function f is continuous and increasing for $x \geq 0$. The table gives values of f at selected values of x .

x	6.5	6.999	7.001	7.5
$f(x)$	-6.5	-6.001	-5.999	-5.5

Approximate the value of $\lim_{x \rightarrow 7} 5e^{f(x)}$.

ANSWERS to Mid-Unit 1 Corrective Assignment

1. See graph. Straight line at $a = 9$.	2. ≈ 5 inches per year	3. $\frac{a(17)-a(16.999)}{17-16.999}$	4. The interest paid on the 3 rd month.
5. The average rate of change of interest being paid between the 1 st and 3 rd months.	6. An estimate of the rate at which the interest payment is changing on the 4 th month.	7a. 4 7d. 2 7g. 4	7d. DNE 7e. 1 7h. 3 7c. 4 7f. -2 7i. 3
<p>8. One possible graph:</p> 	9. 8	10a. 1 10b. 0 10c. DNE 10d. 1	11. -4
	12. 6	13. $-\frac{1}{4}$	14. 0
	15. $\frac{1}{4}$	16. $-\frac{1}{64}$	17. 1
18. D	19. C	20. E	21. $5e^{-6} = \frac{5}{e^6}$