

Name: _____ Date: _____

Unit 2 CA – Differentiation: Definition & Fundamental Properties

Find the average rate of change of each function on the given interval. Use appropriate units if necessary.

1. $s(t) = \frac{1}{t-3}$; $[0, 1]$
 s represents miles
 t represents seconds

Use the following table to find the average rate of change on the given interval.

t (item)	2	60	100	200	500
$p(t)$ (dollars)	-7,000	-100	350	900	2,500

2. $[60, 500]$

3. $2 \leq t \leq 100$

Each limit represents the instantaneous rate of change of a function. Identify the original function, and the x -value of the instantaneous rate of change.

4. $\lim_{x \rightarrow 4} \frac{(x^2 - 3x) - (4)}{x - 4}$

Function: $f(x) =$

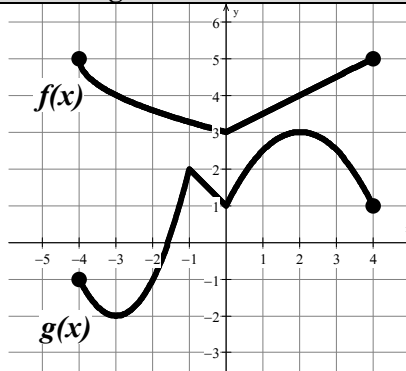
Instantaneous rate at $x =$

5. $\lim_{h \rightarrow 0} \frac{9(5+h) - 10(5+h)^2 + (205)}{h}$

Function: $f(x) =$

Instantaneous rate at $x =$

Use the graphs of f and g to find the following.



6. $h(x) = f(g(x))$. Find the average rate of change on the interval $[2, 4]$.

7. $j(x) = g(f(x))$. Find the average rate of change on the interval $[-3, 2]$.

Use the table to find the value of the derivatives of each function.

8.

x	$h(x)$	$h'(x)$	$r(x)$	$r'(x)$
-2	-3	2	-2	4

a. $f(x) = -h(x)r(x)$
Find $f'(-2)$.

b. $g(x) = \frac{h(x)+r(x)}{r(x)}$
Find $g'(-2)$.

c. $w(x) = (4 - 2h(x))(1 - r(x))$
Find $w'(-2)$.

9. $S(x)$ is the number of students in Mr. Kelly's class and x is the number of years since 2015.

a. Explain the meaning of $S(3) = 127$.

b. Explain the meaning of $S'(3) = 4$.

Find the value of the derivative at the given point. Round or truncate to three decimal places.

10. $f(x) = \frac{x}{\sqrt{3x-5}}$ at $x = 5$.

11. $f(x) = \tan^2 x$ at $x = -2$.

12. Use the tables to estimate the value of $f'(45)$. Indicate units of measures.

t minutes	20	30	60	65	75
$v(t)$ feet per minute	100	207	455	501	606

Find the derivative of each function.

13. $s(t) = 7 \sin t - 3 \ln t - 5e^t$

14. $f(x) = 7x^3 - 4x^2 + x - 3$

15. $f(x) = \frac{x^2}{\cos x}$

16. $y = \sqrt{x} - \cot x$

17. $d(t) = (4 - t) \cos t$

18. $g(x) = \frac{x^4 - 3x^2 + 6x}{x^2}$

19. $g(x) = 4x^3 e^x$

20. $h(x) = 8\sqrt{x} - \frac{5}{x^4} + \pi^2$

21. $g(x) = \frac{3}{4}x^{-1} - \frac{1}{2}\sqrt{x}$

22. At what x -value(s) does the function
 $f(x) = \frac{x^4}{4} - 3x^3 + 9x^2 + 7$ have a horizontal
tangent?

23. If $f(x) = \cos x + \sin x$, find $f' \left(\frac{\pi}{3} \right)$

Find the equation for the tangent line to the function at the given value of x .

24. $f(x) = 6\sqrt{x} + \frac{4}{x} - 1$ at $x = 4$

25. $f(x) = 2e^x + \cos x$ at $x = 0$

26. Is the function differentiable at $x = -1$? $f(x) = \begin{cases} 3x^4 + 9x - 6, & x < -1 \\ \frac{2}{x} - x - 11, & x \geq -1 \end{cases}$

27. What values of a and b would make the function differentiable at $x = 2$?

$$f(x) = \begin{cases} ax^3 + 2x + 1, & x < 2 \\ 2 - bx, & x \geq 2 \end{cases}$$

Unit 2 Corrective Assignment – Answers

1. $-\frac{1}{6}$ miles / sec		2. 5.909 dollars / item		3. 75 dollars / item	
4. $f(x) = x^2 - 3x$ at $x = 4$		5. $f(x) = 9x - 10x^2$ at $x = 5$		6. $-\frac{1}{2}$	
7. 0	8a. 16	8b. 2	8c. -52	9a. In 2018, there are 127 students in Mr. Kelly's class.	
9b. In 2018, the number of students Mr. Kelly teaches is increasing by 4 students per year.			10. 0.079	11. 25.2348	12. 8.2666 ft per min ²
13. $7 \cos t - \frac{3}{t} - 5e^t$		14. $21x^2 - 8x + 1$		15. $\frac{2x \cos x + x^2 \sin x}{\cos^2 x}$	
16. $\frac{1}{2\sqrt{x}} + \csc^2 x$		17. $-\cos t - \sin t(4 - t)$		18. $2x - \frac{6}{x^2}$	
19. $12x^2e^x + 4x^3e^x$		20. $\frac{4}{\sqrt{x}} + \frac{20}{x^5}$		21. $-\frac{3}{4x^2} - \frac{1}{4\sqrt{x}}$	
22. $x = 0, 3, 6$		23. $\frac{1-\sqrt{3}}{2}$		24. $y - 12 = \frac{5}{4}(x - 4)$	
25. $y - 3 = 2x$		26. Yes! Show work for continuity and differentiability.		27. $a = -\frac{1}{16}$ $b = -\frac{5}{4}$	