Chapter 2 Derivatives And Their Uses

1. Complete the table and use it to predict the limit, if it exists.

$f(x) = \dfrac{6x+7}{\frac{1}{5} - x^2}$

$\lim\limits_{x \to -0.5} f(x) = ?$

x	$f(x)$
–0.51	
–0.501	
–0.5001	
↓	↓
–0.5	?
↑	↑
–0.4999	
–0.499	
–0.49	

A) –160.0
B) 80.0
C) –80.0
D) –0.5
E) does not exist
Ans: C

2. Use properties of limits and algebraic methods to find the limit, if it exists.

$\lim\limits_{x \to 3} (8x^3 - 13x^2 + 3x + 13)$

A) –121
B) 121
C) 141
D) –141
E) does not exist
Ans: B

3. Find $\lim\limits_{x \to 5} \dfrac{x^2 - x}{2x - 5}$ without using a graphing calculator or making tables.

A) 2
B) –5
C) 0
D) 4
E) ∞
Ans: D

4. Use properties of limits and algebraic methods to find the limit, if it exists.

$\lim\limits_{x\to 1/4} \dfrac{-7-8x}{144x^2+5}$

A) $\dfrac{9}{14}$

B) $\dfrac{1}{14}$

C) $-\dfrac{1}{14}$

D) $-\dfrac{9}{14}$

E) does not exist

Ans: D

5. Use properties of limits and algebraic methods to find the limit, if it exists.

$\lim\limits_{x\to -5} \dfrac{x^2+9x+14}{x^2+2x}$

A) $\dfrac{2}{5}$

B) $-\dfrac{2}{5}$

C) $-\dfrac{5}{2}$

D) $\dfrac{5}{2}$

E) does not exist

Ans: B

6. Use properties of limits and algebraic methods to find the limit, if it exists.

$\lim\limits_{x\to 13} \dfrac{x^2-4x-32}{x^2-9x+8}$

A) $-\dfrac{17}{12}$

B) $\dfrac{17}{12}$

C) $\dfrac{12}{17}$

D) $-\dfrac{12}{17}$

E) does not exist

Ans: B

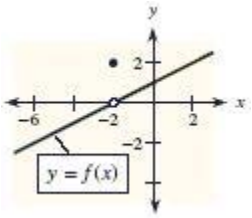
7. Use properties of limits and algebraic methods to find the limit, if it exists.

$\lim\limits_{h\to 0}\dfrac{9(x+h)^2-9x^2}{h}$

A) 0
B) $2x$
C) $9x$
D) $18x$
E) does not exist
Ans: D

8. A graph of $y=f(x)$ is shown and a c-value is given. For this problem, use the graph to find $\lim\limits_{x\to c} f(x)$.

$c=-2$



A) 0
B) 2
C) –6
D) –4
E) does not exist
Ans: A

9. Use properties of limits and algebraic methods to find the limit, if it exists.

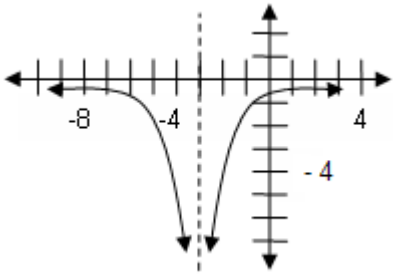
$\lim\limits_{x\to 3} f(x)$, where $f(x)=\begin{cases}16-7x & \text{for } x<3\\ x^2-5x & \text{for } x\geq 3\end{cases}$

A) 5
B) 6
C) –6
D) –5
E) does not exist
Ans: E

10. Find $\lim\limits_{x\to -6^+} f(x)$ for $f(x)=\dfrac{|x+6|}{x+6}$.

A) 6
B) –1
C) 0
D) 1
E) –6
Ans: D

11. Find $\lim_{x \to -3^+} f(x)$ for the graph of $f(x)$ given below.



A) $-\infty$
B) 0
C) -3
D) inf
E) 3
Ans: A

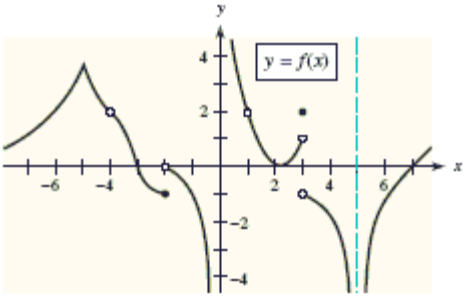
12. Find $\lim_{x \to -1^-} \frac{1}{x+1}$.

A) 1
B) 0
C) $-\infty$
D) –1
E) ∞
Ans: C

13. Find $\lim_{x \to 6^+} \frac{-1}{(x-6)^2}$.

A) 6
B) ∞
C) 0
D) –6
E) $-\infty$
Ans: E

14. For the given *x*-value, use the figure to determine whether the function is continuous or discontinuous at that *x*-value.



$x = 5$

A) discontinuous
B) continuous
Ans: A

15. Determine whether the function is continuous or discontinuous at the given *x*-value.

$$f(x) = \begin{cases} x^2 + 5 & \text{if } x \le -4 \\ 9x^2 - 123 & \text{if } x > -4 \end{cases} \qquad x = -4$$

A) discontinuous
B) continuous
Ans: B

16. Determine whether the given function is continuous. If it is not, identify where it is discontinuous.

$y = 3x^2 - 4x + 7$

A) discontinuous at $x = 5$
B) discontinuous at $x = 0$
C) discontinuous at $x = -5$
D) discontinuous at $x = 10$
E) continuous everywhere
Ans: E

17. Determine whether the function is continuous or discontinuous at the given *x*-value.

$$y = \frac{x^2 - 5}{x + 4}, \qquad x = -7$$

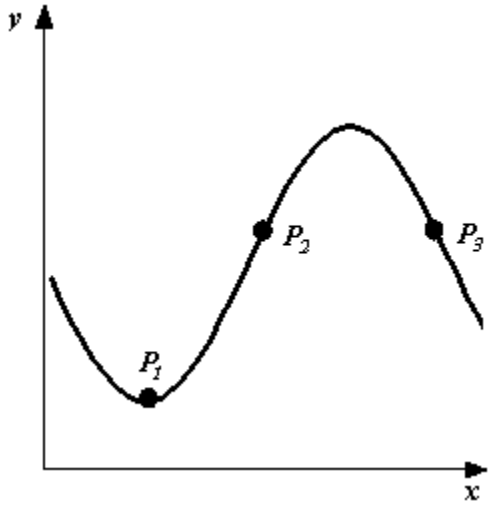
A) continuous
B) discontinuous
Ans: A

18. Determine whether the given function is continuous. If it is not, identify where it is discontinuous. You can verify your conclusions by graphing the function with a graphing utility, if one is available.

$$y = \frac{8x^2 + 3x + 7}{x + 1/2}$$

A) discontinuous at $x = 1/2$
B) discontinuous at $x = -1$
C) discontinuous at $x = 1$
D) discontinuous at $x = -1/2$
E) continuous everywhere
Ans: D

19. By imagining tangent lines at points P_1, P_2, and P_3, state whether the slopes are positive, zero, or negative at these points.



A) At P_1 : positive slope
At P_2 : negative slope
At P_3 : positive slope

B) At P_1 : zero slope
At P_2 : negative slope
At P_3 : positive slope

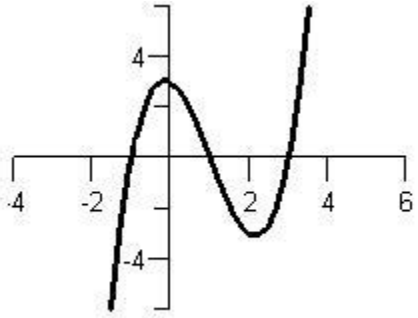
C) At P_1 : zero slope
At P_2 : positive slope
At P_3 : negative slope

D) At P_1 : positive slope
At P_2 : positive slope
At P_3 : positive slope

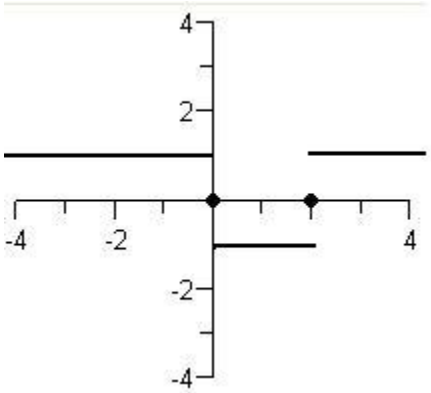
E) At P_1 : positive slope
At P_2 : negative slope
At P_3 : negative slope

Ans: C

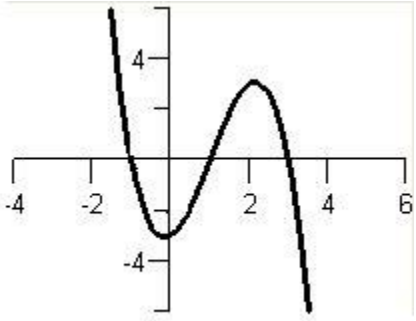
20. Which graph represents $f'(x)$ if the graph of $f(x)$ is displayed below?



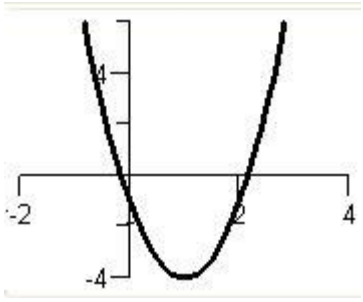
A)



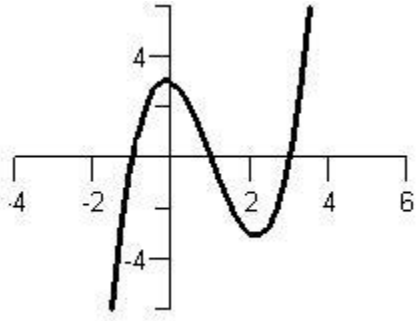
B)



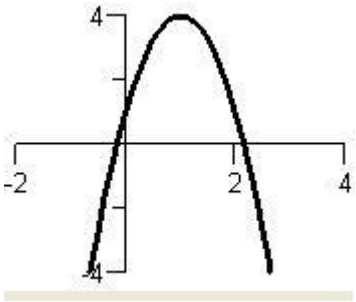
C)



D)



E)



Ans: C

21. For the given function, find the average rate of change over the specified interval.
$f(x) = 5 - 5x - 4x^2$ over $(-2, 4)$

A) 0
B) –19
C) 19
D) 13
E) –13
Ans: E

22. Find the average rate of change of $f(x) = 8x + 7$ between $x = 3$ and $x = 8$.

A) 8
B) 7
C) 3
D) 11
E) 5
Ans: A

23. Find the instantaneous rate of change of the function $f(x) = 6x^2 + 5x$ at $x = 2$.

A) 30
B) 26
C) 41
D) 42
E) 29
Ans: E

24. For the function in this problem, find the instantaneous rate of change of the function at the given value.

$f(x) = 9x^2 - 5x + 5;\ x = 4$

A) 0
B) 41
C) 31
D) 67
E) 77
Ans: D

25. For the function in this problem, find the slope of the tangent line at the given value.

$f(x) = 5x^2 - 9x + 9;\ x = 1$

A) 1
B) 14
C) –4
D) 0
E) 19
Ans: A

26. Find the slope of the tangent at $x = -1$.

$f(x) = 6x^2 + 2x$

A) –14
B) –4
C) –10
D) 4
E) 0
Ans: C

27. For the function in this problem, find the derivative, by using the definition.

$f(x) = 5x^2 - 3x + 9$

A) $5x^2 - 3x + 9$
B) $5x^2 - 3x$
C) $10x$
D) $5x - 3$
E) $10x - 3$
Ans: E

28. Find the slope of the tangent to the graph of $f(x)$ at any point.

$f(x) = 9x^2 + 6x$

A) $18x + 6$
B) $18x - 6$
C) $9x + 6$
D) $9x^2 + 6x$
E) $3x$
Ans: A

29. Find $f'(x)$ of $f(x) = -7x + 8$ by using the definition of the derivative.

A) $f'(x) = 8$

B) $f'(x) = -7$

C) $f'(x) = 7x$

D) $f'(x) = 7$

E) $f'(x) = -7x$

Ans: B

30. Write the equation of the line tangent to the graph of $f(x)$ at $x = -1$.
$f(x) = 5x^2 + 8x$

A) $y = -2x - 2$

B) $y = -2x + 2$

C) $y = -2x$

D) $y = -2x - 5$

E) $y = -2x + 5$

Ans: D

31. The population of a town is $f(x) = 3x^2 - 15x + 200$ people after x weeks (for $0 \le x \le 20$). Find $f'(x)$ to find the instantaneous rate of change of the population after 8 weeks.

A) 48

B) 64

C) 33

D) 31

E) 49

Ans: C

32. An automobile dealership finds that the number of cars that it sells on day x of an advertising campaign is $S(x) = -x^2 + 18x$ (for $0 \le x \le 7$). Find $S'(x)$ to find the instantaneous rate of change on day $x = 2$.

A) 14

B) 18

C) 16

D) 22

E) 21

Ans: A

33. Differentiate the given function.

$y = \dfrac{9x^6}{6}$

A) $6x^5$
B) $9x^6$
C) $9x^7$
D) $54x^5$
E) $9x^5$

Ans: E

34. Find the derivative of $g(w) = 20\sqrt[4]{w}$.

A) $g'(w) = \dfrac{5}{\sqrt[4]{w^3}}$
B) $g'(w) = \dfrac{20}{\sqrt[4]{w^3}}$
C) $g'(w) = \dfrac{4}{\sqrt[4]{w^3}}$
D) $g'(w) = 5\sqrt[4]{w^3}$
E) $g'(w) = 20\sqrt[4]{w^3}$

Ans: A

35. Find the derivative of the function.

$y = 5x^{-1} - 9x^{-2} + 13$

A) $-5x^{-2} - 18x^{-3}$
B) $-5x^{-2} + 18x^{-3}$
C) $-5 - 18x^{-1}$
D) $-5x^{-2} - 9x^{-3}$
E) $-5x^{-1} + 9x^{-2}$

Ans: B

36. For the function given, find $f'(x)$.

$f(x) = x^4 - 13x - 8$

A) $x^3 - 13$
B) $4x^3 - 8$
C) $4x^3 - 13$
D) $4x^4 - 13x$
E) $x^4 - 13x - 8$

Ans: C

37. Find the derivative of the function.

$f(x) = 9x^{-8/3} - 9x^{-10/3}$

A) $-24x^{-11/3} - 30x^{-13/3}$

B) $-24x^{-5/3} + 30x^{-7/3}$

C) $-24x^{-11/3} + 30x^{-13/3}$

D) $-24x^{-5/3} - 30x^{-7/3}$

E) $-72x^{-11/3} - 90x^{-13/3}$

Ans: C

38. Find the derivative of $f(x) = \frac{8}{\sqrt[4]{x}}$.

A) $f'(x) = -\frac{2}{\sqrt[4]{x^3}}$

B) $f'(x) = -\frac{2}{\sqrt[4]{x^5}}$

C) $f'(x) = \frac{4}{\sqrt[4]{x^3}}$

D) $f'(x) = -\frac{4}{\sqrt[4]{x^5}}$

E) $f'(x) = \frac{2}{\sqrt[4]{x^5}}$

Ans: B

39. Find the derivative of the function.

$y = 7x^4 - 2x^2 + 6x - 7$

A) $28x^4 - 4x^2 + 6x - 7$

B) $28x^3 - 4x + 6$

C) $7x^3 - 2x + 6$

D) $28x^3 - 4x$

E) $7x^4 - 2x^2 + 6x - 7$

Ans: B

40. Find the derivative of the function.

$h(x) = 11x^{21} + 19x^{11} - 7x^8 + 14x - 6$

A) $220x^{20} + 190x^{10} - 49x^7 + 14$

B) $231x^{21} + 209x^{11} - 56x^8 + 14x$

C) $11x^{20} + 19x^{10} - 7x^7 + 14$

D) $231x^{20} + 209x^{10} - 56x^7 + 14$

E) $220x^{21} + 190x^{11} - 49x^8 + 14x$

Ans: D

41. Find the derivative of $h(x) = 3\sqrt[3]{x^2} - \dfrac{6}{\sqrt[3]{x}}$.

A) $h'(x) = \dfrac{1}{\sqrt[3]{x}} - \dfrac{1}{\sqrt[3]{x^4}}$

B) $h'(x) = \dfrac{2}{\sqrt[2]{x}} + \dfrac{2}{\sqrt[2]{x^3}}$

C) $h'(x) = \dfrac{2}{\sqrt[3]{x}} + \dfrac{2}{\sqrt[3]{x^4}}$

D) $h'(x) = \dfrac{1}{\sqrt[2]{x}} - \dfrac{1}{\sqrt[2]{x^3}}$

E) $h'(x) = \dfrac{2}{\sqrt[2]{x}} - \dfrac{2}{\sqrt[2]{x^3}}$

Ans: C

42. At the indicated point, find the instantaneous rate of change of the function.
$R(x) = 17x + 2x^2,\ x = 3$

A) 29
B) 52
C) 19
D) 21
E) 23
Ans: A

43. If $f(x) = 60\sqrt[4]{x^3} - \dfrac{972}{\sqrt[4]{x}}$, find $f'(81)$.

A) $f'(81) = 14$

B) $f'(81) = 15$

C) $f'(81) = 21$

D) $f'(81) = 16$

E) $f'(81) = 26$

Ans: D

44. Find the derivative at the given *x*-value with the appropriate rule.
$y = 8 - 24\sqrt{x}$ at $x = 9$

A) –8
B) –64
C) 8
D) –4
E) 0
Ans: D

45. If $f(x) = x^5$, find $\left.\frac{df}{dx}\right|_{x=-2}$.

A) $\left.\frac{df}{dx}\right|_{x=-2} = -32$

B) $\left.\frac{df}{dx}\right|_{x=-2} = -192$

C) $\left.\frac{df}{dx}\right|_{x=-2} = 320$

D) $\left.\frac{df}{dx}\right|_{x=-2} = -128$

E) $\left.\frac{df}{dx}\right|_{x=-2} = 80$

Ans: E

46. If $f(x) = \frac{250}{\sqrt{x}} + 30\sqrt{x}$, find $\left.\frac{df}{dx}\right|_{x=25}$.

A) $\left.\frac{df}{dx}\right|_{x=25} = 2$

B) $\left.\frac{df}{dx}\right|_{x=25} = -2$

C) $\left.\frac{df}{dx}\right|_{x=25} = 10$

D) $\left.\frac{df}{dx}\right|_{x=25} = -10$

E) $\left.\frac{df}{dx}\right|_{x=25} = 4$

Ans: A

47. Suppose the Marginal Cost Businesses can buy multiple licenses for *PowerZip* data compression software at a total cost of approximately $C(x) = 24x^{2/3}$ dollars for x licenses. Find the derivative of this cost function at $x = 64$.

A) $C'(64) = 8$

B) $C'(64) = 4$

C) $C'(64) = 2$

D) $C'(64) = 12$

E) $C'(64) = 6$

Ans: B

48. Suppose the number of people newly inflected on day *t* of a flu epidemic is $f(t) = 13t^2 - t^3$ (for $0 \le t \le 13$). Find the instantaneous rate of change of this number on day 10.

A) $f'(10) = 300$

B) $f'(10) = -27$

C) $f'(10) = -40$

D) $f'(10) = 230$

E) $f'(10) = 60$

Ans: C

49. Find the derivative of $f(x) = 6\sqrt[3]{x}(8x+1)$ by using the Product Rule. Simplify your answer.

A) $f'(x) = \dfrac{1}{\sqrt[3]{x^2}} + 32\sqrt[3]{x}$

B) $f'(x) = \dfrac{6}{\sqrt[3]{x^2}} + 32\sqrt[3]{x}$

C) $f'(x) = \dfrac{6}{\sqrt[3]{x^2}} + 64\sqrt[3]{x}$

D) $f'(x) = \dfrac{2}{\sqrt[3]{x^2}} + 64\sqrt[3]{x}$

E) $f'(x) = \dfrac{2}{\sqrt[3]{x^2}} + 32\sqrt[3]{x}$

Ans: D

50. Find $\dfrac{ds}{dt}$ if $s = \left(t^6 + 8\right)\left(t^3 - 8\right)$.

A) $6t^8 - 6t^5 + 24t^2$

B) $9t^8 + 48t^5 + 3t^2$

C) $6t^8 + 48t^5 + 24t^2$

D) $9t^8 - 6t^5 + 3t^2$

E) $9t^8 - 48t^5 + 24t^2$

Ans: E

51. Find the derivative, but do not simplify your answer.

$y = \left(7x^7 - 3x^3 - 9x\right)\left(3x^5 - 8x^8 + 9x^9 - 6\right)$

A) $\left(7x^7 - 3x^3 - 9x\right)\left(15x^4 - 64x^7 + 81x^8\right) + \left(49x^6 - 9x^2 - 9\right)\left(3x^5 - 8x^8 + 9x^9 - 6\right)$

B) $\left(15x^4 - 64x^7 + 81x^8\right) + \left(49x^6 - 9x^2 - 9\right)$

C) $\left(49x^6 - 9x^2 - 9\right)\left(15x^4 - 64x^7 + 81x^8\right)$

D) $\left(49x^6 - 9x^2 - 9\right)\left(3x^5 - 8x^8 + 9x^9 - 6\right) - \left(7x^7 - 3x^3 - 9x\right)\left(15x^4 - 64x^7 + 81x^8\right)$

E) $\left(7x^7 - 3x^3 - 9x\right)\left(15x^4 - 64x^7 + 81x^8\right) - \left(49x^6 - 9x^2 - 9\right)\left(3x^5 - 8x^8 + 9x^9 - 6\right)$

Ans: A

52. Find the derivative of $f(z) = \left(z^{28} + z^{14} + 1\right)\left(z^{15} - z\right)$ by using the Product Rule. Simplify your answer.

A) $f'(z) = 43z^{42} - z$

B) $f'(z) = 42z^{43} + 29z^{30} - z^2$

C) $f'(z) = 42z^{43} - z^2$

D) $f'(z) = 43z^{42} + 30z^{29} - 1$

E) $f'(z) = 43z^{42} - 1$

Ans: E

53. Find the derivative of $\frac{1}{x^6}$.

A) $\frac{1}{6x^5}$

B) $\frac{-6}{x^7}$

C) $\frac{-1}{6x}$

D) $\frac{-6}{x^5}$

E) $\frac{1}{6x^7}$

Ans: B

54. Find the indicated derivative and simplify.

$C'(x)$ for $C(x) = \dfrac{7x^3}{2x^4 + 7}$

A) $-\dfrac{14x^2\left(2x^4 + 21\right)}{\left(2x^4 + 7\right)^2}$

B) $\dfrac{x^2\left(2x^4 - 21\right)}{\left(2x^4 + 7\right)^2}$

C) $-\dfrac{x^2\left(2x^4 + 21\right)}{\left(2x^4 + 7\right)^2}$

D) $-\dfrac{7x^2\left(2x^4 - 21\right)}{\left(2x^4 + 7\right)^2}$

E) $\dfrac{7x^2\left(2x^4 + 21\right)}{\left(2x^4 + 7\right)^2}$

Ans: D

55. Find the derivative of $f\left(x\right) = \dfrac{x + 5}{4x^2 + 5}$ by using Quotient Rule. Simplify your answer.

A) $f'\left(x\right) = \dfrac{12x^2 + 40x + 5}{\left(4x^2 + 5\right)^3}$

B) $f'\left(x\right) = -\dfrac{4x^2 + 40x - 5}{\left(4x^2 + 5\right)^3}$

C) $f'\left(x\right) = \dfrac{4x^2 + 40x - 5}{\left(4x^2 + 5\right)^2}$

D) $f'\left(x\right) = -\dfrac{4x^2 + 40x - 5}{\left(4x^2 + 5\right)^2}$

E) $f'\left(x\right) = -\dfrac{12x^2 + 40x + 5}{\left(4x^2 + 5\right)^2}$

Ans: D

56. Find the indicated derivative and simplify.

$\frac{dy}{dx}$ for $y = \frac{1-6x^2}{x^4-4x^2+2}$

A) $\frac{2x\left(3x^4+x^2-4\right)}{\left(x^4-4x^2+2\right)^2}$

B) $\frac{2x\left(3x^3-x-4\right)}{\left(x^4-4x^2+2\right)^2}$

C) $\frac{4x\left(3x^4-x^2-4\right)}{\left(x^4-4x^2+2\right)^2}$

D) $\frac{4x\left(3x^3+x-4\right)}{\left(x^4-4x^2+2\right)^2}$

E) $\frac{4x\left(3x^4+x^2-4\right)}{\left(x^4-4x^2+2\right)^2}$

Ans: C

57. Find the derivative of $f(x) = \left(x^6+3\right)\frac{x^2+2}{x+2}$.

A) $f'(x) = 6x^5\frac{x^2+2}{x+2} + \left(x^6+3\right)\frac{3x^2+4x+2}{(x+2)^2}$

B) $f'(x) = 7x^6\frac{x^2+2}{x+2} + \left(x^6+3\right)$

C) $f'(x) = 6x^5\frac{x^2+2}{x+2} + \left(x^6+3\right)\frac{x^2+4x-2}{(x+2)^2}$

D) $f'(x) = 6x^5\frac{x^2+2}{x+2} + \left(x^6+3\right)$

E) $f'(x) = 7x^6\frac{x^2+2}{x+2} + \left(x^6+3\right)\frac{x^2+4x-2}{(x+2)^2}$

Ans: C

58. Find the indicated derivative and simplify.

$f'(x)$ for $f(x) = \dfrac{(x+4)(x-7)}{x^2+6}$

A) $\dfrac{11x^2 - 62x - 18}{\left(x^2+6\right)^2}$

B) $\dfrac{3x^2 - 34x - 18}{\left(x^2+6\right)^2}$

C) $\dfrac{3x^2 + 68x - 18}{\left(x^2+6\right)^2}$

D) $\dfrac{11x^2 - 34x - 18}{\left(x^2+6\right)^2}$

E) $\dfrac{11x^2 - 68x - 18}{\left(x^2+6\right)^2}$

Ans: C

59. Find the derivative of $\dfrac{\sqrt{x}+1}{\sqrt{x}-1}$.

A) 1

B) $\dfrac{1}{4x}$

C) $\dfrac{-1}{(x-1)\sqrt{x^2-1}}$

D) $-x$

E) $\dfrac{-1}{\sqrt{x}\left(\sqrt{x}-1\right)^2}$

Ans: E

60. If the cost C (in dollars) of removing p percent of the particulate pollution from the exhaust gases at an industrial site is given by

$$C(p) = \frac{2000p}{130 - p},$$

find the rate of change of C with respect to p.

A) $\dfrac{4000000}{(130 - p)^2}$

B) $\dfrac{260000}{(130 - p)^2}$

C) $\dfrac{16900}{(130 - p)^2}$

D) $\dfrac{2000}{(130 - p)}$

E) $\dfrac{130}{(130 - p)}$

Ans: B

61. The number of bottles of whiskey that a store will sell in a month at a price of p dollars per bottle is $N(p) = \dfrac{2250}{p + 2}$. Find the rate of change of this quantity when the price is \$9.

A) –18.60
B) 204.55
C) –18.75
D) 18.50
E) –9.30

Ans: A

62. After x months, monthly sales of a compact disc are predicted to be $S(x) = x^2(125 - x^3)$ thousand. Find the rate of change of the sales after 2 months in thousands per month.

A) –48
B) 452
C) 420
D) 476
E) 468

Ans: C

63. Find $f'(x)$ and $f''(x)$.

$f(x) = 6 + 5x - 5x^3$

A) $f'(x) = 5 - 15x^2,\ f''(x) = -30x$

B) $f'(x) = 30x,\ f''(x) = 30$

C) $f'(x) = 15x^2,\ f''(x) = 30x$

D) $f'(x) = 5 - 15x^2,\ f''(x) = 30$

E) $f'(x) = -10,\ f''(x) = 0$

Ans: A

64. Find the third derivative.

$y = 7x^3 - 5x^2 + 7x$

A) 42

B) $42x$

C) 21

D) $21x$

E) 0

Ans: A

65. Find the indicated derivative.

Find $y^{(4)}$ if $y = x^8 - 8x^3$.

A) $336x^5$

B) $336x^4$

C) $336x^4 - 48x$

D) $1680x^5 - 48x$

E) $1680x^4$

Ans: E

66. Find $f''(x)$ for the function $\sqrt{x^{11}}$.

A) $\frac{99}{4}x^{\frac{7}{2}}$

B) $\frac{99}{8}x^{\frac{7}{2}}$

C) $\frac{11}{2}x^{\frac{9}{2}}$

D) $\frac{99}{16}x^{\frac{7}{2}}$

E) $\frac{11}{4}x^{\frac{9}{2}}$

Ans: A

67. Find $f'''(x)$ for the function $\sqrt{x^{21}}$.

A) $\frac{399}{4}x^{\frac{15}{2}}$

B) $\frac{6783}{8}x^{\frac{15}{2}}$

C) $\frac{399}{4}x^{\frac{17}{2}}$

D) $\frac{6783}{16}x^{\frac{15}{2}}$

E) $\frac{399}{8}x^{\frac{17}{2}}$

Ans: B

68. Find $f^{(4)}(x)$ for the function $\sqrt{x^{13}}$.

A) $\frac{9009}{4}x^{\frac{9}{2}}$

B) $\frac{9009}{8}x^{\frac{5}{2}}$

C) $\frac{143}{8}x^{\frac{7}{2}}$

D) $\frac{9009}{16}x^{\frac{5}{2}}$

E) $\frac{143}{16}x^{\frac{7}{2}}$

Ans: D

69. Find the second derivative.

$h(x) = x^6 - \frac{1}{x^6}$

A) $42x^4 - \frac{30}{x^8}$

B) $42x^4 + \frac{42}{x^8}$

C) $30x^4 - \frac{42}{x^8}$

D) $42x^4 - \frac{30}{x^4}$

E) $30x^4 + \frac{42}{x^4}$

Ans: C

70. Find $f''(5)$ for the function $\frac{1}{4x^3}$.

A) $\frac{1}{625}$
B) $\frac{1}{500}$
C) $\frac{3}{3125}$
D) $\frac{9}{500}$
E) $\frac{1}{4}$
Ans: C

71. Find the third derivative.

$y = \frac{2}{x^3}$

A) $\frac{-120}{x^5}$
B) $\frac{120}{x^6}$
C) 0
D) $\frac{40}{x^5}$
E) $\frac{-120}{x^6}$
Ans: E

72. Find the second derivative of the function $(x^2 - 3)(x^2 + 7)$.

A) $4x^3 + 8x - 21$
B) $4x^3 - 8x$
C) $12x^2 + 20$
D) $12x^2 + 8$
E) $4x^3 + 20x + 21$
Ans: D

73. Evaluate the expression $\frac{d^3}{dx^3} x^7 \Big|_{x=-1}$.

A) 7
B) 42
C) –42
D) –210
E) 210
Ans: E

74. Find the second derivative of the function $\frac{2x-7}{2x+7}$.

A) $-\frac{56}{(2x+7)^3}$

B) $\frac{112}{(2x+7)^3}$

C) $-\frac{112}{(2x+7)^3}$

D) $-\frac{28}{(2x+7)^2}$

E) $\frac{28}{(2x+7)^2}$

Ans: C

75. If the formula describing the distance *s* (in feet) an object travels as a function of time *t* (in seconds) is $s = 60 + 90t - 17t^2$. What is the acceleration of the object when $t = 5$?

A) 0 ft/sec^2

B) –34 ft/sec^2

C) –80 ft/sec^2

D) 34 ft/sec^2

E) 80 ft/sec^2

Ans: B

76. After *t* hours, a car is a distance $s(t) = 60t + \frac{300}{t+4}$ miles from its starting point. Find the velocity after 6 hours.

A) 51 miles/hour

B) 66 miles/hour

C) 54 miles/hour

D) 57 miles/hour

E) 63 miles/hour

Ans: D

77. If $f(g(x)) = \sqrt{x^2 - 3x + 2}$ and $f(x) = \sqrt{x}$, find $g(x)$.

A) x

B) $x - 3$

C) $\sqrt{x^2 - 3x + 2}$

D) $x^2 - 3x + 2$

E) $x - \sqrt{3x} + \sqrt{2}$

Ans: D

78. If $f(g(x)) = \dfrac{1}{8x^2 + 6x}$ and $g(x) = 8x^2 + 6x$, find $f(x)$.

A) $\dfrac{1}{x}$

B) $\dfrac{1}{8x + 6}$

C) $\dfrac{1}{8x^2 + 6x}$

D) $\dfrac{1}{8x^2} + \dfrac{1}{6x}$

E) $8x^2 + 6x$

Ans: A

79. If $f(g(x)) = \left(\dfrac{x+4}{x-4}\right)^2$ and $f(x) = x^2$, find $g(x)$.

A) $(x+4)^2$

B) $\dfrac{x}{(x-4)}$

C) x^2

D) $\dfrac{1}{(x-4)^2}$

E) $\dfrac{x+4}{x-4}$

Ans: E

80. Find $f'(x)$ for the given function.

$f(x) = 3 - (x^2 - 1)^2$

A) $-4x(x^2 - 1)$

B) $2x(x^2 - 1)$

C) $-x(x^2 - 1)$

D) $x(x^2 - 1)$

E) $-2x(x^2 - 1)$

Ans: A

81. Differentiate the given function.

$y = \dfrac{(5x)^4}{4}$

A) $5(5x)^4$

B) $5(4x)^3$

C) $5(5x)^3$

D) $(5x)^3$

E) $(20x)^3$

Ans: C

82. Find the derivative of the given function. Simplify and express the answer using positive exponents only.

$y = \dfrac{9}{2}(4x^4 - 5x^2 + 2)^6$

A) $27(4x^4 - 5x^2 + 2)^5(8x^2 - 5)$

B) $108x(4x^4 - 5x^2 + 2)^5(16x^2 - 5)$

C) $54x(4x^4 - 5x^2 + 2)^5(8x^2 - 5)$

D) $27x(4x^4 - 5x^2 + 2)^5(16x^2 - 5)$

E) $108x(4x^4 - 5x^2 + 2)^5(8x^2 - 5)$

Ans: C

83. Differentiate the given function.

$k(x) = \frac{2}{7}(5x^7 - x + 6)^{14}$

A) $28(5x^7 - x + 6)^{13}(35x^6 - x)$

B) $4(5x^7 - x + 6)^{13}(35x^6 - 1)$

C) $4(35x^6 - 1)^{13}$

D) $4(5x^7 - x - 6)^{15}(7x^6 - 1)$

E) $2(5x^7 - x + 12)^{13}(35x^7 - 1)$

Ans: B

84. Differentiate the given function.

$y = \sqrt{7x^5 + 3x}$

A) $\frac{1}{2}\left(35x^4 + 3\right)^{-1/2}$

B) $\frac{1}{2}\left(7x^5 + 3x\right)^{-1/2}$

C) $\frac{1}{2}\left(35x^5 + 3x\right)^{-1/2}\left(7x^5 + 3\right)$

D) $\frac{1}{2}\left(7x^5 + 3x\right)^{-1/2}\left(35x^4 + 3\right)$

E) $-\frac{1}{2}\left(7x^5 + 3x\right)^{-3/2}\left(35x^4 + 3\right)$

Ans: D

85. Differentiate the given function.

$p(q) = (q^3 + 7)^{-4}$

A) $-\frac{12q^2}{\left(q^3 + 7\right)^6}$

B) $-\frac{3q^2}{\left(q^3 + 7\right)^5}$

C) $-\frac{12q^2}{\left(q^3 + 7\right)^5}$

D) $-\frac{3q^2}{\left(q^3 + 7\right)^3}$

E) $-\frac{4q^3}{\left(q^3 + 7\right)^5}$

Ans: C

86. Differentiate the given function.

$y = \dfrac{(7x+1)^6 - 7x}{17}$

A) $\dfrac{7}{17}\left[6(7x+1)^5 - 1\right]$

B) $\dfrac{1}{17}\left[6(7x+1)^5 - 7\right]$

C) $\dfrac{7}{17}\left[(7x+1)^6 - 7\right]$

D) $\dfrac{7}{17}\left[6(x+1)^5 - 7\right]$

E) $\dfrac{1}{17}\left[42(7x+1)^5 - 1\right]$

Ans: A

87. Differentiate the given function.

$y = \dfrac{1}{(6x^8 + 3x + 1)^{7/2}}$

A) $-\dfrac{7}{2}\left(6x^8 + 3x + 1\right)^{-\frac{9}{2}}$

B) $-\dfrac{7}{2}\left(48x^7 + 3\right)^{-\frac{5}{2}}\left(6x^8 + 3x + 1\right)$

C) $-\dfrac{7}{2}\left(6x^8 + 3x + 1\right)^{-\frac{5}{2}}\left(48x^7 + 3\right)$

D) $-\dfrac{9}{2}\left(6x^8 + 3x + 1\right)^{-\frac{5}{2}}\left(6x^8 + 3x + 1\right)$

E) $-\dfrac{7}{2}\left(6x^8 + 3x + 1\right)^{-\frac{9}{2}}\left(48x^7 + 3\right)$

Ans: E

88. Find the derivative of the given function. Simplify and express the answer using positive exponents only.

$y = \left(4 - x^2\right)\left(8x^2 + 7x\right)^4$

A) $-x^3(8x+7)^3\left(40x^3 - 21x^2 + 128x - 56\right)$

B) $-x^3(8x+7)^3\left(40x^3 + 21x^2 - 128x + 56\right)$

C) $-x^3(8x+7)^3\left(40x^3 - 21x^2 - 128x - 56\right)$

D) $-2x^3(8x+7)^3\left(40x^3 - 21x^2 - 128x + 56\right)$

E) $-2x^3(8x+7)^3\left(40x^3 + 21x^2 - 128x - 56\right)$

Ans: E

89. Use the Generalized Power Rule to find the derivative of the function $x^4\sqrt{x^4-1}$.

A) $\dfrac{2x^3\left(3x^4-1\right)}{\sqrt{x^4-1}}$

B) $\dfrac{2x^4\left(-3x^4+2\right)}{\sqrt{x^4-1}}$

C) $\dfrac{2x^4\left(3x^4-2\right)}{\sqrt{x^4-1}}$

D) $\dfrac{2x^3\left(-3x^4+2\right)}{\sqrt{x^4-1}}$

E) $\dfrac{2x^3\left(3x^4-2\right)}{\sqrt{x^4-1}}$

Ans: E

90. Differentiate the given function.

$y=\dfrac{7}{(6x)^6}$

A) $\dfrac{252}{(6x)^7}$

B) $-\dfrac{42}{(6x)^7}$

C) $-\dfrac{252}{(6x)^7}$

D) $\dfrac{42}{(6x)^7}$

E) $-\dfrac{42}{(6x)^5}$

Ans: C

91. Differentiate the given function.

$y = \dfrac{3}{4x^4}$

A) $-\dfrac{12}{x^5}$

B) $-\dfrac{3}{x^4}$

C) $-\dfrac{12}{x^4}$

D) $-\dfrac{3}{x^5}$

E) $-\dfrac{4}{x^5}$

Ans: D

92. A company's cost function is $C(x) = \sqrt{2x^2 + 800}$ dollars, where x is the number of units. Find the marginal cost function and evaluate it for $x = 30$. Round your answer to two decimal places.

A) 1.18 dollars
B) 2.35 dollars
C) 50.99 dollars
D) 17.65 dollars
E) 66.33 dollars

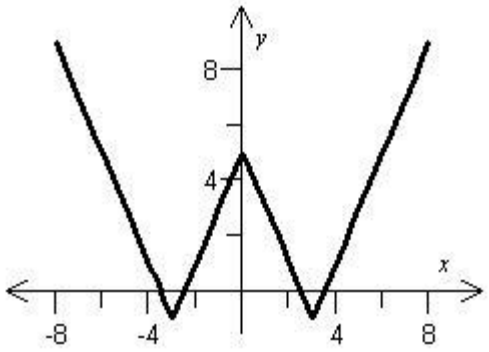
Ans: A

93. If \$1800 is deposited in a bank paying r% interest compounded annually, 5 years later its value will be $V(r) = 1800(1 + 0.01r)^5$ dollars. Find $V'(8)$. Round your answer to nearest cent.

A) 122.44 dollars
B) 132.24 dollars
C) 24.49 dollars
D) 26.45 dollars
E) 142.82 dollars

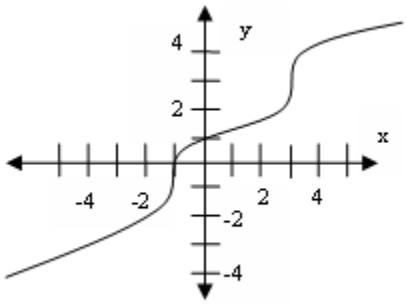
Ans: A

94. For the function displayed in the graph below, find all x-values at which the derivative does not exist.



A) 3
B) –3, 0, 3
C) 4
D) –1, 5
E) none
Ans: B

95. For the function displayed in the graph below, find all x-values at which the derivative does not exist.



A) 2
B) 0, 3
C) none
D) –1
E) –1, 3
Ans: E

96. For the function $f(x) = (x+2)^{2/9}$, find the x-value at which the derivative does not exist.

A) - 2
B) 2
C) 0
D) $-\frac{7}{9}$
E) none
Ans: A

97. Use the numerical derivative function on a graphing calculator to calculate the derivative of the function $f(x) = \frac{1}{x^2}$ at $x = 0$. Is the calculator correct?

A) -2; No, the calculator is not correct.
B) 0; Yes, the calculator is correct.
C) $\frac{1}{2}$; No, the calculator is not correct.
D) 0; No, the calculator is not correct.
E) -2; Yes, the calculator is correct.
Ans: D

98. If a function is continuous at a point, then it is also not defined at that same point?

A) True
B) False
Ans: B

