

Test Bank: <https://testbankpack.com/p/test-bank-for-calculus-10th-edition-by-anton-bivens-davis-isbn-0470647701-9780470647707/>

Solutions Manual

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1. Find the average rate of change of y with respect to x for $y = f(x) = x^4$ over the interval $[1, 7]$.

A) 0.375 B) -0.500 C) -0.500 D) -17.993 E) 2.999

Ans: B

Difficulty: Easy

Section: 2.1

2. Find the average rate of change of y with respect to x over the interval $[1, 5]$. $y = f(x) = 3x^3$

A) 62 B) 95 C) 93 D) 74 E) 372

Ans: C

Difficulty: Easy

Section: 2.1

3. Find the instantaneous rate of change of $y = 4x^2$ with respect to x at $x_0 = 7$.

A) 8 B) 56 C) 14 D) 28 E) 22

Ans: B

Difficulty: Easy

Section: 2.1

4. Find the instantaneous rate of change of $y = \frac{9}{-x}$ with respect to x at $x_0 = 5$.

A) -225 B) -8.9600 C) 0.3600 D) -0.3600 E) -0.0617 Ans: D

Difficulty: Medium

Section: 2.1

5. Find the instantaneous rate of change of $y = -4x^7$ with respect to x at a general point x_0 .

A) $-28x_0^7$ B) $-4x_0$ C) $-4x_0^7$ D) $-4x_0^6$ E) $-28x_0^6$ Ans: E

Difficulty: Easy

Section: 2.1

6. Find the instantaneous rate of change of $y = \frac{2}{x^3}$ with respect to x at a general point x_0 .

A) $\frac{-6}{x_0^3}$ B) $\frac{2}{x_0^4}$ C) $\frac{-6}{x_0^4}$ D) $-\frac{6}{x_0^4}$ E) $\frac{6}{x_0^3}$

Ans: C

7. Find the slope of the tangent line to the graph of $f(x) = 7x^4 - 9$ at a general point x_0 .

A) $28x_0^3 - 9$ B) $7x_0^3$ C) $28x_0^3$ D) $7x_0^3 - 1$ E) $7x_0^3 - 9$ Ans: C

Difficulty: Easy

Section: 2.1

8. Answer true or false. The slope of the tangent line to the graph of $f(x) = -2x^2 - 1$ at $x_0 = 3$ is -13 .

Ans: False

Difficulty: Easy

Section: 2.1

9. Answer true or false. Use a graphing utility to graph $y = 3t^2$ on $[0, 4]$. If this graph represents a position versus time curve for a particle, the instantaneous velocity of the particle is increasing over the graphed domain.

Ans: True

Difficulty: Easy

Section: 2.1

10. Use a graphing utility to graph $y = t^2 - 7t + 10$ on $[0, 10]$. If this graph represents a position versus time curve for a particle, the instantaneous velocity of the particle is zero at what time? Assume time is in seconds.

A) 6s B) 3s C) 3.5s D) 1.5s E) 7s

Ans: C

Difficulty: Medium

Section: 2.1

11. A rock is dropped from a height of 2,704 feet and falls toward earth in a straight line. In t seconds the rock drops a distance of $16t^2$ feet. What is the instantaneous velocity downward when it hits the ground?

A) 116,985,856 feet/s

D) 32 feet/s

B) 416 feet/s

E) 26 feet/s

C) 208 feet/s

Ans: B

Difficulty: Easy

Section: 2.1

12. Answer true or false. The magnitude of the instantaneous velocity is always less than the magnitude of the average velocity.

Ans: False

Difficulty: Easy

Section: 2.1

13. Answer true or false. If a rock is thrown straight upward to a height of 26 feet from the ground, when it returns to earth its average velocity will be its initial velocity.

Ans: False

Difficulty: Easy

Section: 2.1

14. Answer true or false. If an object is thrown straight upward with an instantaneous velocity of 35 m/s, its instantaneous velocity at the point where it stops rising is 0. Ans: True

Difficulty: Easy

Section: 2.1

15. An object moves in a straight line so that after t s its distance in mm from its original position is given by $s = 7t^3 + 4t$. Its instantaneous velocity at $t = 4$ s is
A) 336 mm B) 1,348 mm C) 5,380 mm D) 340 mm E) 116 mm Ans: D

Difficulty: Medium

Section: 2.1

16. Find the instantaneous rate of change of y with respect to x at $x_0 = 4$. $y = 6x^2 - 2$
A) 48 B) 46 C) 24 D) 50 E) 96

Ans: A

Difficulty: Easy

Section: 2.1

17. Find the instantaneous rate of change of y with respect to x at $x_0 = 81$. $y = \sqrt{x} - 2$
A) $\frac{1}{18}$ B) $\frac{1}{9}$ C) $\frac{11}{9}$ D) $\frac{18}{17}$ E) $\frac{1}{81}$

Ans: A

Difficulty: Hard

Section: 2.1

18. Let $f(x) = \frac{1}{x^2}$. Find the average rate of change of y with respect to x over the interval

[5, 6].

Ans: $\frac{11}{900}$

Difficulty: Easy

Section: 2.1

19. Let $f(x) = \frac{1}{x^2}$. Find the instantaneous rate of change of y with respect to x at the point

$$x = 2.$$

$$\text{Ans: } \frac{1}{4}$$

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Difficulty: Easy

Section: 2.1

20. Let $y = x^2 + 2$. Find the average rate of change of y with respect to x over the interval $[-5, -1]$.

$$\text{Ans: } -6$$

Difficulty: Easy

Section: 2.1

21. Let $y = x^2 + 6$. Find the instantaneous rate of change of y with respect to x at the point $x = -5$.

$$\text{Ans: } -10$$

Difficulty: Easy

Section: 2.1

22. Let $y = \frac{1}{x+1}$. Find the average rate of change of y with respect to x over the interval $[2, 4]$.

$$\text{Ans: } \frac{1}{3}$$

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Difficulty: Medium

Section: 2.1

23. Let $y = \frac{1}{x-3}$. Find the instantaneous rate of change of y with respect to x at the point $x = 5$.

$$\text{Ans: } \frac{1}{4}$$

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Difficulty: Medium

Section: 2.1

24. Let $y = \frac{2}{x}$. Find the average rate of change of y with respect to x over the given interval $[3, 6]$.

$$\text{Ans: } \frac{1}{20}$$

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Difficulty: Medium

Section: 2.1

25. Let $y = x^{-4}$. Find the instantaneous rate of change of y with respect to x at the point $x = 1$.

Ans: $-\frac{4}{5}$

Difficulty: Medium
Section: 2.1

26. Let $f(x) = \frac{1}{5x}$. Find the slope of the tangent to the graph of f at a general point x_0 using limits and find the slope of the tangent line at $x_0 = 4$

Ans: $\lim_{x_1 \rightarrow x_0} \frac{\frac{1}{5x_1} - \frac{1}{5x_0}}{x_1 - x_0} = -\frac{1}{5x_0^2}$

The slope of the tangent line at $x_0 = 4$ is $-\frac{1}{80}$.

Difficulty: Medium
Section: 2.1

27. Let $f(x) = \frac{1}{x^4}$. Find the slope of the tangent to the graph of f at a general point x_0 using limits and find the slope of the tangent at $x_0 = 5$.

Ans: $\lim_{x_1 \rightarrow x_0} \frac{\frac{1}{x_1^4} - \frac{1}{x_0^4}}{x_1 - x_0} = -\frac{4}{x_0^5}$

The slope of the tangent line at $x_0 = 5$ is $-\frac{4}{3125}$.

Difficulty: Medium
Section: 2.1

28. Let $f(x) = \frac{4}{x^4}$. Find the slope of the tangent to the graph of f at a general point x_0 using limits and find the slope of the tangent at $x_0 = -5$.

Ans: $\lim_{x_1 \rightarrow x_0} \frac{\frac{4}{x_1^4} - \frac{4}{x_0^4}}{x_1 - x_0} = \frac{4(-5^4 - x_1^4)}{(x_1 - x_0)(-5^4 - x_1^4)} = \frac{16}{3,125}$

The slope of the tangent line at $x_0 = -5$ is $\frac{16}{3,125}$.

Difficulty: Medium
Section: 2.1

29. Let $f(x) = 4x^3$. Find the slope of the tangent to the graph of f at a general point x_0 using limits and find the slope of the tangent at $x_0 = 2$.

$$\text{Ans: } \lim_{x_1 \rightarrow x_0} \frac{4x_1^3 - 4x_0^3}{x_1 - x_0} = 12x_0^2$$

Slope of tangent at $x_0 = 2$ is 48

Difficulty: Easy

Section: 2.1

30. A rock is dropped from a height of 144 feet and falls toward the earth in a straight line. In t seconds, the rock drops a distance of $s = 16t^2$ feet. What is the average velocity of the rock while it is falling? Use limits to find the instantaneous velocity of the rock when it hits the ground.

Ans: Average velocity: 48 feet per second

Instantaneous velocity at ground = 96 feet per second

Difficulty: Medium

Section: 2.1

31. A particle moves in a straight line from its initial position so that after t seconds, its distance is given by $s = t^2 + t$ feet from its initial position. Find the average velocity of the particle over the interval $[3,6]$ seconds. Use limits to find the instantaneous velocity of the particle at $t = 1$ second.

Ans: Average velocity = 10 feet per second

The instantaneous velocity at $t = 1$ second is 3 feet per second.

Difficulty: Medium

Section: 2.1

32. A particle moves in a straight line from its initial position so that after t seconds, its distance is given by $s = \frac{1}{11}t^2$ feet from its initial position. Find the average velocity of the particle over the interval $[4,8]$ seconds. Use limits to find the instantaneous velocity of the particle at $t = 4$ seconds.

Ans: Average velocity = $\frac{4}{11}$ feet per second.

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The instantaneous velocity at $t = 4$ seconds is $\frac{8}{11}$ feet per second.

Difficulty: Medium

Section: 2.1

33. Let $f(x) = ax^2 + b$, where a and b are constant. Use the method of Section 3.1 to show that the slope of the tangent to the graph of f at $x = x_0$ is $2ax_0$.

$$\text{Ans: } m_{\text{tan}} = \lim_{x_1 \rightarrow x_0} \frac{ax_1^2 + b - (ax_0^2 + b)}{x_1 - x_0} = \lim_{x_1 \rightarrow x_0} \frac{ax_1^2 - ax_0^2}{x_1 - x_0} = \lim_{x_1 \rightarrow x_0} a \frac{x_1^2 - x_0^2}{x_1 - x_0} = \lim_{x_1 \rightarrow x_0} a \frac{(x_1 - x_0)(x_1 + x_0)}{x_1 - x_0} = \lim_{x_1 \rightarrow x_0} a(x_1 + x_0) = a(x_0 + x_0) = 2ax_0$$

Difficulty: Hard
Section: 2.1

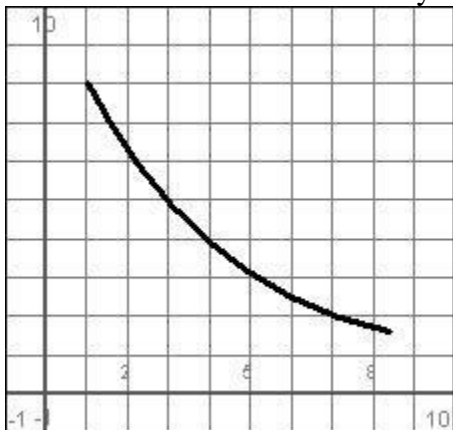
34. Let $f(x) = ax^3 + b$, where a and b are constants. Use the method of Section 3.1 to show that the slope of the tangent to the graph of f at $x = x_0$ is $3ax_0^2$.

Ans:

$$m_{\text{tan}} = \lim_{x_1 \rightarrow x_0} \frac{ax_1^3 + b - (ax_0^3 + b)}{x_1 - x_0} = \lim_{x_1 \rightarrow x_0} \frac{ax_1^3 - ax_0^3}{x_1 - x_0} = \lim_{x_1 \rightarrow x_0} a \frac{x_1^3 - x_0^3}{x_1 - x_0} = \lim_{x_1 \rightarrow x_0} a \frac{(x_1 - x_0)(x_1^2 + x_1x_0 + x_0^2)}{x_1 - x_0} = \lim_{x_1 \rightarrow x_0} a(x_1^2 + x_1x_0 + x_0^2) = a(x_0^2 + x_0x_0 + x_0^2) = 3ax_0^2$$

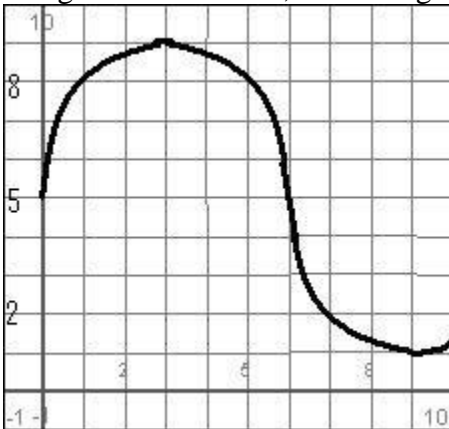
Difficulty: Medium
Section: 2.1

35. The graph shows the position versus time curve for a particle moving on a straight line. Is the instantaneous velocity increasing or decreasing with time?



Ans: decreasing
Difficulty: Easy
Section: 2.1

36. The figure shows the position versus time curve for a certain particle moving along a straight line. Estimate, from the graph, the average velocity over the interval 3 to 9.



Ans: $-4/3$

Difficulty: Easy

Section: 2.1

37. Given $f(x) = x^3 + 1$, find the slope of the graph of f at the x -value $x_0 = 4$.

Ans: 48

Difficulty: Medium

Section: 2.1

38. Given $f(x) = 13\sqrt{x}$, find the slope of the graph of f at $x_0 = 1$.

Ans: $\frac{13}{2}$

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Difficulty: Medium

Section: 2.1

39. Find the instantaneous rate of change of $f(x) = \frac{2}{x^3}$ at $x_0 = 5$.

Ans: $-\frac{6}{625}$

Difficulty: Medium

Section: 2.1

40. Find the instantaneous rate of change of $f(x) = 5x^2 - 12$ at $x_0 = 5$. Ans: 50

Difficulty: Medium

Section: 2.1

41. Find the instantaneous rate of change of $f(x) = 5x^2 - 6x + 9$ at $x_0 = 3$.
Ans: 24
Difficulty: Medium
Section: 2.1