

***Calculus Early Transcendentals 2nd edition Sullivan
Test Bank***

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Chapter 2

1. The slope of the tangent line $f(x) = -\frac{1}{2}x^2$ to the graph at the point (2,-2) is

- a. -2
- b. 2
- c. $-\frac{1}{2}$
- d. $\frac{1}{2}$
- e. -4

ANSWER: a

2. The slope of the tangent line to the graph $f(x) = 3\sqrt{x}$ at the point (4,6) is

- a. $-\frac{3}{4}$
- b. $\frac{3}{4}$
- c. $-\frac{4}{3}$
- d. $\frac{4}{3}$
- e. $\frac{3}{2}$

ANSWER: b

3. The slope of the tangent line to the graph $f(x) = \frac{1}{x^2}$ at the point (-1,1) is

- a. -3
- b. -2
- c. -1
- d. 1
- e. 2

ANSWER: e

4. The slope of the tangent line to the graph $f(x) = \frac{2}{x+4}$ at the point (-3, 2) is

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- a. -3
- b. -2
- c. 2
- d. 3
- e. 4

ANSWER: b

5. An equation of the tangent line to the graph $f(x) = x^2 - x$ at the point $(-2, 6)$ is

- a. $y = -5x - 4$
- b. $y = -5x - 2$
- c. $y = -5x + 2$
- d. $y = -5x + 3$
- e. $y = -5x + 4$

ANSWER: a

6. An equation of the tangent line to the graph $f(x) = 2x - x^2$ at the point $(-1, -3)$ is

- a. $y = 4x - 3$
- b. $y = 4x - 1$
- c. $y = 4x + 1$
- d. $y = 4x + 3$
- e. $y = 4x + 5$

ANSWER: c

7. An equation of the tangent line to the graph $f(x) = \frac{3}{2x-1}$ at the point $(1, 3)$ is

- a. $y = -6x + 9$
- b. $y = -6x + 3$
- c. $y = -6x + 1$
- d. $y = -6x - 1$
- e. $y = -6x - 3$

ANSWER: a

8. An equation of the tangent line to the graph $f(x) = \sqrt{x+3}$ at the point $(6, 3)$ is

- a. $y = \frac{1}{6}x + 3$

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b. $y = \frac{1}{6}x + 6$

c. $y = \frac{1}{6}x + 2$

d. $y = \frac{1}{6}x + \frac{7}{3}$

e. $y = \frac{1}{6}x + \frac{5}{3}$

ANSWER: c

9. The instantaneous rate of change of $f(x) = 4x - 3$ at $c = 5$ is

- a. -3
- b. 4
- c. 5
- d. 17
- e. 20

ANSWER: b

10. The instantaneous rate of change of $f(x) = \frac{8}{x+1}$ at $c = 3$ is

- a. -2
- b. -1
- c. $-\frac{1}{2}$
- d. $\frac{1}{2}$
- e. 2

ANSWER: c

11. The instantaneous rate of change of $f(x) = 3\sqrt{x+5}$ at $c = 4$ is

- a. $\frac{3}{2}$
- b. $\frac{1}{2}$
- c. $\frac{1}{2}$

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d. 1

e. $\frac{3}{2}$

ANSWER: c

12. The instantaneous rate of change of $f(x) = 3x - 2x^2$ at $c = 2$ is

a. -5

b. -3

c. -2

d. 3

e. 5

ANSWER: a

13. The instantaneous rate of change of $f(x) = \frac{3}{x+1}$ at $c = 2$ is

a. -3

b. $-\frac{1}{3}$

c. $\frac{1}{3}$

d. 1

e. 3

ANSWER: b

14. The instantaneous rate of change of $f(x) = \sqrt{x} + 5$ at $c = 9$ is

a. $-\frac{1}{6}$

b. $-\frac{1}{3}$

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c. $-\frac{1}{2}$

d. $\frac{1}{6}$

e. $\frac{1}{3}$

ANSWER: d

15. The derivative of $f(x) = 3x^2 - 1$ at $x = -1$ is

a. -6

b. -3

c. -1

d. 3

e. 6

ANSWER: a

16. The derivative of $f(x) = \frac{4}{x} + 5$ at $x = -2$ is

a. -4

b. -2

c. -1

d. 2

e. 4

ANSWER: c

17. The derivative of $f(x) = \sqrt{x-4}$ at $x = 8$ is

a. $-\frac{1}{8}$

b. $-\frac{1}{4}$

c. $-\frac{1}{2}$

d. $\frac{1}{4}$

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e. $\frac{1}{8}$

ANSWER: d

18. The derivative of $f(x) = -8x + 7$ at $x = 0$ is

- a. -8
- b. 7
- c. 0
- d. 8
- e. -7

ANSWER: a

19. The derivative of $f(x) = \frac{4}{x+5}$ at $x = -4$ is

- a. -5
- b. -4
- c. 1
- d. 4
- e. 5

ANSWER: b

20. The derivative of $f(x) = \sqrt{x} - 4$ at $x = 4$ is

- a. -4
- b. $-\frac{1}{4}$
- c. $-\frac{1}{2}$
- d. $\frac{1}{4}$
- e. $\frac{1}{2}$

ANSWER: d

21. A pump is used to empty a 350-gallon hot tub. The table shows the amount of water, $W(t)$, measured in gallons, remaining in the hot tub at time t , measured in minutes after the pump is turned on.

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T	0	15	30	45	60	90
$W(t)$	350	320	280	225	170	105

Approximate $W'(30)$ in this context.

- Water is draining at a rate of $28/3$ gallons per minute when the pump has been operating for 30 minutes.
- Forty gallons of water have been removed from the hot tub in 15 minutes of time.
- There are 280 gallons of water in the hot tub 30 minutes after the pump is turned on.
- Water is draining from the hot tub at a rate of $8/3$ gallons per minute when the pump has been operating for 30 minutes.
- Water is draining from the hot tub at a rate of 280 gallons per half-hour.

ANSWER: d

22. A dehumidifier is used to reduce the moisture in a basement. The level of moisture reported on the display panel when the dehumidifier is turned on is 70%. The percent moisture, $P(t)$, at time t is recorded for different times t in the table.

T	0	2	6	15	20	30
$P(t)$	70	67	60	53	51	50

Estimate $P'(20)$.

- 0.20% per minute
- 0.10% per minute
- 0.10% per minute
- 0.20% per minute
- 0.40% per minute

ANSWER: b

23. Let $f(x) = 4 - x^2$. Then $f'(x)$ is

- 2x
- $-x^2$
- 2x
- x^2
- $4 - 2x$

ANSWER: a

24. Let $f(x) = \frac{1}{2} - 4x$. Then $f'(x)$ is

- 4

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b. $-\frac{7}{2}$

c. $\frac{1}{2}$

d. $-\frac{1}{2}$

e. 4

ANSWER: a

25. Let $f(x) = \sqrt{9-x}$. Then $f'(x)$ is

a. $\frac{\sqrt{9-x}}{2}$

b. $\frac{2}{\sqrt{9-x}}$

c. $\frac{1}{2\sqrt{9-x}}$

d. $-\frac{1}{2\sqrt{9-x}}$

e. $-\frac{2}{\sqrt{9-x}}$

ANSWER: d

26. Let $f(x) = \frac{8}{\sqrt{4-x}}$. Then $f'(x)$ is

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

b. $-\frac{4}{(4-x)^{\frac{1}{2}}}$

c. $\frac{4}{(4-x)^{\frac{1}{2}}}$

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

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e. $\frac{8}{(4-x)^{\frac{3}{2}}}$

ANSWER: d

27. Let $f(x) = \frac{3}{\sqrt{x}} + 4$. Then $f'(x)$ is

a. $-\frac{3}{2x^{\frac{3}{2}}}$

b. $-\frac{3}{2x^{\frac{3}{2}}} + 4$

c. $\frac{3}{2x^{\frac{3}{2}}}$

d. $\frac{3}{x^{\frac{3}{2}}}$

e. $\frac{3}{2x^{\frac{3}{2}}} + 4$

ANSWER: a

28. Let $f(x) = x - \frac{2}{x}$. Then $f'(x)$ is

a. $1 - \frac{3}{x^2}$

b. $1 - \frac{2}{x^2}$

c. 1

d. $1 + \frac{2}{x^2}$

e. $1 + \frac{3}{x^2}$

ANSWER: d

29. Let $f(x) = \sqrt{9-x}$. Then $f'(x)$ does not exist if x is

a. -9

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- b. -5
- c. 5
- d. 6
- e. 9

ANSWER: e

30. Let $f(x) = \frac{3}{\sqrt{x}} + 4$. Then does not exist if x is

- a. 0
- b. 1
- c. 4
- d. 9
- e. 16

ANSWER: a

31. Let $f(x) = x - \frac{2}{x}$. Then $f'(x)$ does not exist if x is

- a. -2
- b. -1
- c. 0
- d. 1
- e. 2

ANSWER: c

32. Let $f(x) = \frac{8}{\sqrt{5-x}}$. Then $f'(x)$ does not exist if x is

- a. -5
- b. 1
- c. 2
- d. 3
- e. 5

ANSWER: e

33. Let $f(x) = |x|$. Which of the following is true?

- a. f is discontinuous at 0.
- b. f has a derivative at 0.

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- c. f has a corner at $(0,0)$.
- d. f has a horizontal tangent line at $(0,0)$.
- e. f has a vertical tangent line at $(0,0)$.

ANSWER: c

34. Let $f(x) = \sqrt[3]{x}$. Which of the following is true?

- a. f is discontinuous at 0.
- b. f has a derivative at 0.
- c. f has a corner at $(0,0)$.
- d. f has a horizontal tangent line at $(0,0)$.
- e. f has a vertical tangent line at $(0,0)$.

ANSWER: e

35. Let $f(x) = \lfloor x \rfloor$. Which of the following is true?

- a. f is discontinuous at 0.
- b. f has a derivative at 0.
- c. f has a corner at $(0,0)$.
- d. f has a horizontal tangent line at $(0,0)$.
- e. f has a vertical tangent line at $(0,0)$.

ANSWER: a

36. Let $f(x) = -x^2$. Which of the following is true?

- a. f is discontinuous at 0.
- b. f does not have a derivative at 0.
- c. f has a corner at $(0,0)$.
- d. f has a horizontal tangent line at $(0,0)$.
- e. f has a vertical tangent line at $(0,0)$.

ANSWER: d

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37. Let $f(x) = 2x^3$. Which of the following is true?

- a. f is discontinuous at 0.
- b. f does not have a derivative at 0.
- c. f has a corner at (0,0).
- d. f has a horizontal tangent line at (0,0).
- e. f has a vertical tangent line at (0,0).

ANSWER: d

38. Let $f(x) = \begin{cases} 2x+1 & x < 0 \\ -x+1 & x > 0 \end{cases}$. Which of the following is true?

- a. f is discontinuous at 0.
- b. f has a derivative at 0.
- c. f has a corner at (0,0).
- d. f has a horizontal tangent line at (0,0).
- e. f has a vertical tangent line at (0,0).

ANSWER: a

39. Let $f(x) = \begin{cases} x^2 & x \leq 0 \\ -x^2 & x > 0 \end{cases}$. Which of the following is true?

- a. f is discontinuous at 0.
- b. f does not have a derivative at 0.
- c. f has a corner at (0,0).
- d. f has a horizontal tangent line at (0,0).
- e. f has a vertical tangent line at (0,0).

ANSWER: d

40. Let $f(x) = 3x - 2$. Which of the following is true?

- a. f is discontinuous at 0.
- b. f has a derivative at 0.

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- c. f has a corner at $(0,0)$.
- d. f has a horizontal tangent line at $(0,0)$.
- e. f has a vertical tangent line at $(0,0)$.

ANSWER: b

41. Let $f(x) = \lfloor x \rfloor$. Which of the following is true?

- a. f is discontinuous at 0.
- b. f has a derivative at 0.
- c. f has a corner at $(0,0)$.
- d. f has a horizontal tangent line at $(0,0)$.
- e. f has a vertical tangent line at $(0,0)$.

ANSWER: a

42. Let $f(x) = -4x + 2$. Which of the following is true?

- a. f is discontinuous at 0.
- b. f has a derivative at 0.
- c. f has a corner at $(0,0)$.
- d. f has a horizontal tangent line at $(0,0)$.
- e. f has a vertical tangent line at $(0,0)$.

ANSWER: b

43. Let $f(x) = \frac{1}{e}$. Then $f'(x)$ is

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a.



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b.



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c.



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d.



e. 0

ANSWER: e

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44. Let $f(x) = \frac{5}{\pi}$. Then $f'(x)$ is

- a. 0
- b. $-\frac{5}{\pi^2}$
- c. $-\frac{5}{\pi}$
- d. $\frac{5}{\pi}$
- e. $\frac{5}{\pi^2}$

ANSWER: a

45. Let $f(x) = \frac{1}{2}x^2 - 3x + 4$. Then $f'(x) = 0$ if x is

- a. -3
- b. -1
- c. 0
- d. 1
- e. 3

ANSWER: e

46. Let $f(x) = \frac{x^3 - 2x^2}{x}$. Then $f'(x) = 0$ if x is

- a. -2
- b. -1
- c. 0
- d. 1
- e. 2

ANSWER: d

47. Let $f(x) = x - e^x$. Then $f'(x) = 0$ if x is

- a. $-e$
- b. -1
- c. 0

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d. 1

e. e

ANSWER: c

48. Let $f(x) = 6x - e^x$. Then $f'(x) = 0$ if x is

a. -6

b. $-\ln 6$

c. 0

d. $\ln 6$

e. 6

ANSWER: d

49. Let $f(x) = \frac{1}{2}x^2 - 3x + 4$. Then $f'(x) = 0$ for all x in

a. $(-\infty, \infty)$

b. $(-\infty, -3)$

c. $(-3, \infty)$

d. $(-3, 3)$

e. $(3, \infty)$

ANSWER: e

50. Let $f(x) = \frac{x^3 - 2x^2}{x}$. Then $f'(x) = 0$ for all x in

a. $(-\infty, \infty)$

b. $(-\infty, 0)$

c. $(-1, \infty)$

d. $(-\infty, 0) \cup (1, \infty)$

e. $(1, \infty)$

ANSWER: e

51. Let $f(x) = x - e^x$. Then $f'(x) = 0$ for all x in

a. $(-\infty, \infty)$

b. $(-\infty, 0)$

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- c. $(0, \infty)$
- d. $(-\infty, e)$
- e. $(-\infty, e^2)$

ANSWER: b

52. Let $f(x) = 6x - e^x$. Then $f'(x) = 0$ for all x in

- a. $(-\infty, \infty)$
- b. $(-\infty, \ln 6)$
- c. $(\ln 6, \infty)$
- d. $(-\infty, 6)$
- e. $(-\infty, -\ln 6)$

ANSWER: b

53. Let $f(x) = 6x - e^x$. Then which of the following is the largest interval, of those listed, for which $f'(x) > 0$ for all x in that interval?

- a. $(-\infty, \infty)$
- b. $(-\infty, \ln 6)$
- c. $(\ln 6, \infty)$
- d. $(-\infty, -\ln 6)$
- e. $(-\infty, -\ln 6)$

ANSWER: a

54. Let $f(x) = x^3 - 6x^2$. Then which of the following is the largest interval, of those listed, for which $f'(x) > 0$ for all x in that interval?

- a. $(4, \infty)$
- b. $(-\infty, 0)$
- c. $(0, 4)$
- d. $(-\infty, 0) \cup (4, \infty)$
- e. $(-\infty, \infty)$

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ANSWER: d

55. Let $f(x) = \frac{1}{2}x^2 - 3x + 4$. Then which of the following is the largest interval, of those listed, for which $f'(x) > 0$ for all x in that interval?

- a. $(-\infty, \infty)$
- b. $(-\infty, -3)$
- c. $(-\infty, 3)$
- d. $(-3, 3)$
- e. $(3, \infty)$

ANSWER: c

56. Let $f(x) = x - e^x$. Then $f'(x) < 0$ for all x in

- a. $(-\infty, \infty)$
- b. $(-\infty, 0)$
- c. $(0, \infty)$
- d. $(-\infty, e)$
- e. $(-\infty, e^2)$

ANSWER: c

57. Let $f(x) = 6x - e^x$. Then which of the following is the largest interval, of those listed, for which $f'(x) < 0$ for all x in that interval?

- a. $(-\infty, \infty)$
- b. $(-\infty, \ln 6)$
- c. $(\ln 6, \infty)$
- d. $(-\infty, 6)$
- e. $(-\infty, -\ln 6)$

ANSWER: c

58. Let $f(x) = x + e^x$. Then which of the following is the largest interval, of those listed, for which $f'(x) < 0$ for all x in that interval?

- a. $(-\infty, \infty)$

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- b. $(-\infty, 0)$
- c. $(0, \infty)$
- d. $(-\infty, 3)$
- e. $\emptyset$

ANSWER: e

59. Let $f(x) = e^x$. Then which of the following is the largest interval, of those listed, for which $f'(x) < 0$ for all x in that interval?

- a. $(-\infty, \infty)$
- b. $(-\infty, 0)$
- c. $(0, \infty)$
- d. $(-\infty, 3)$
- e. $\emptyset$

ANSWER: e

60. Let $f(x) = x - 4e^x$. Then which of the following is the largest interval, of those listed, for which $f'(x) < 0$ for all x in that interval?

- a. $(-\infty, \infty)$
- b. $(-\infty, -\ln 4)$
- c. $(-\ln 4, \ln 4)$
- d. $(-\ln 4, \infty)$
- e. $\emptyset$

ANSWER: d

61. Let $f(x) = 4e^x + 3x$. Then which of the following is the largest interval, of those listed, for which for all x in that interval?

- a. $(-\infty, \infty)$
- b. $(-\infty, -\ln \frac{3}{4})$
- c. $(-\ln \frac{3}{4}, \ln \frac{3}{4})$
- d. $(-\infty, \ln \frac{3}{4})$

Chapter 2e. $\emptyset$

ANSWER: e

62. Let $f(x) = x^3 - 6x^2$. Then which of the following is the largest interval, of those listed, for which $f'(x) < 0$ for all x in that interval?

- a. $(4, \infty)$
- b. $(-\infty, 0)$
- c. $(0, 4)$
- d. $(-\infty, 0) \cup (4, \infty)$
- e. $(-\infty, \infty)$

ANSWER: c

63. What is the equation of the normal line to the graph of $f(x) = x^2 - 2x$ at $x = 1$?

- a. $y = x$
- b. $y = -x$
- c. $y + 1 = x - 1$
- d. $x = 1$
- e. $y = -1$

ANSWER: d

64. What is the equation of the normal line to the graph of $f(x) = 3\sqrt{x} + 2$ at $x = 9$?

- a. $y = -2x$
- b. $y - 11 = -2(x - 9)$
- c. $y - 11 = 0.5(x - 9)$
- d. $y = 0.5x$
- e. $y = 0.5x - 9$

ANSWER: b

65. Let $f(x) = (x - 2)^2$. Then $f'(x)$ is

- a. $2x - 4$
- b. $2x + 4$

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c. $-2x - 4$

d. $-2x + 4$

e. $2x + 8$

ANSWER: a

66. Let $f(x) = -3(x + 5)^2$. Then $f'(x)$ is

a. $-6x$

b. $-6x - 15$

c. $-6x - 30$

d. $-6x + 15$

e. $-6x + 30$

ANSWER: c

67. Let $f(x) = (-3x + 5)^2$. Then $f'(x)$ is

a. $-6x$

b. $-6x - 10$

c. $18x - 30$

d. $18x + 30$

e. $18x - 5$

ANSWER: c

68. Let $f(x) = 4x^3 e^x$. Then $f'(x)$ is

a. $12x^2 e^x$

b. $12x^2 + e^x$

c. $4x^2(x + 3)$

d. $4x^2 e^x(x + 3)$

e. $4x^3 e^{x-1}$

ANSWER: d

69. Let e^x / x^4 . Then $f'(x)$ is

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a. $\frac{e^x}{x^4}$

b. $\frac{e^x(x-4)}{x^8}$

c. $\frac{e^x(x-4)}{x^7}$

d. $\frac{e^x(x-4)}{x^6}$

e. $\frac{e^x(x-4)}{x^5}$

ANSWER: e

70. Let $f(x) = \frac{x^4}{e^x}$. Then $f'(x)$ is

a. $\frac{4x^3}{e^x}$

b. $\frac{x^4}{e^x}$

c. $\frac{x^3(4-x)}{e^x}$

d. $\frac{x^3(4-x)}{e^{2x}}$

e. $\frac{x^4-3}{e^x}$

ANSWER: c

71. Let $f(x) = \frac{1-x}{1+x}$. Then $f'(x)$ is

a. $-\frac{2}{(1+x)^2}$

b. $\frac{2}{(1+x)^2}$

c. $-\frac{2x}{(1+x)^2}$

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d. $\frac{2x}{(1+x)^2}$

e. $-\frac{2}{1+x}$

ANSWER: a

72. Let $f(x) = \frac{3}{x^2+1}$. Then $f'(x)$ is

a. $-\frac{6x}{x^2+1}$

b. $\frac{6x}{x^2+1}$

c. $-\frac{6x}{(x^2+1)^2}$

d. $\frac{6x}{(x^2+1)^2}$

e. $-\frac{3x}{(x^2+1)^2}$

ANSWER: c

73. Let $f(x) = x^4 - \frac{4}{x^4}$. Then $f'(x)$ is

a. $4x^3 - \frac{1}{x^3}$

b. $4x^3 - \frac{4}{x^5}$

c. $4x^3 - \frac{16}{x^5}$

d. $4x^3 + \frac{4}{x^5}$

e. $4x^3 + \frac{16}{x^5}$

ANSWER: e

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74. Let $f(x) = \frac{4x}{3x+5}$. Then $f'(x)$ is

- a. $\frac{4}{3}$
- b. $\frac{20}{3x+5}$
- c. $-\frac{20}{(3x+5)^2}$
- d. $\frac{20}{(3x+5)^2}$
- e. $\frac{24x-5}{(3x+5)^2}$

ANSWER: d

75. Let $f(x) = 3xe^x$. Then $f'(x)$ is

- a. $3e^x$
- b. $3e^x + 3x^2e^{x-1}$
- c. $3xe^{x-1}$
- d. $3e^x(x+2)$
- e. $3e^x(x+1)$

ANSWER: d

76. Let $f(x) = \frac{e^x}{x}$. Assuming $x \neq 0$, $f'(x)$ is

- a. e^x
- b. $-\frac{e^x}{x^2}$
- c. $\frac{e^x(1-x)}{x^2}$
- d. $\frac{e^x(x-1)}{x^2}$

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e. $\frac{e^{x-1}(x-1)}{x}$

ANSWER: d

77. Let $f(x) = e^2 x^3$. Then $f'(x)$ is

- a. $3x^2 e^2$
- b. $6x e^2$
- c. $12x e$
- d. $6x^2 e^2$
- e. $12x^2 e$

ANSWER: b

78. Let $f(x) = \frac{x^2 + x}{x}$. Assuming $x \neq 0$, $f'(x)$ is

- a. $\frac{1}{2}$
- b. 0
- c. $x + \frac{1}{2}$
- d. $\frac{x}{2} + 1$
- e. $\frac{x}{2} - 1$

ANSWER: b

79. Let $f(x) = x^3 - 4x^2 + x - 5$. Then $f'(x)$ is

- a. $6x - 8$
- b. $6x$
- c. $3x^2 - 8x$
- d. $-6x$
- e. -6

ANSWER: a

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80. The fourth derivative $\frac{d^4}{dx^4}(x^2 - e^x)$ is

- a. $2x - e^x$
- b. $2 - e^x$
- c. $2 + e^x$
- d. $-e^x$
- e. e^x

ANSWER: d

81. The fifth derivative $\frac{d^5}{dx^5}(5x^4 - e^x)$ is

- a. $60x^3 - e^x$
- b. $180x^2 - e^x$
- c. $360x - e^x$
- d. $360 - e^x$
- e. $-e^x$

ANSWER: e

82. The second derivative $\frac{d^2}{dx^2}((x^2 - 1)(x + 2))$ is

- a. $3x^2 + 4x - 1$
- b. $2x$
- c. 0
- d. $6x + 4$
- e. $6x - 4$

ANSWER: d

83. The sixth derivative $\frac{d^6}{dx^6}(x^6 - 3x^3 + 5)$ is

- a. 720
- b. $72x$
- c. 0
- d. -720

Chapter 2e. $-720 x$

ANSWER: a

84. Let $f(x) = \pi^2 e^x$. Then $f^{(10)}(x)$ is

- a. $2\pi e^x$
- b. 0
- c. $10\pi e^x$
- d. πe^x
- e. $\pi^2 e^x$

ANSWER: e

85. Let $f(x) = x^2 \sin x$. Then $f'(x)$ is

- a. $2x \cos x$
- b. $x(\sin x + \cos x)$
- c. $x(2 \sin x + x \cos x)$
- d. $x(x \sin x + 2 \cos x)$
- e. $x(2 \sin x + \cos x)$

ANSWER: c

86. Let $f(x) = \frac{1 + \cos x}{\sin x}$. Then $f'(x)$ is

- a. $-\tan x$
- b. $\cot x$
- c. $-\cot x - \csc x$
- d. $-\csc x(\cot x + \csc x)$
- e. $-\csc x(\cot x - \csc x)$

ANSWER: d

87. Let $f(x) = \frac{\sin x}{e^x}$. Then $f'(x)$ is

- a. $e^x(\cos x + \sin x)$
- b. $e^x(\cos x - \sin x)$

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c. $\frac{\cos x + \sin x}{e^x}$

d. $\frac{\cos x - \sin x}{e^x}$

e. $\frac{\cos x - \sin x}{e^{2x}}$

ANSWER: d

88. Let $f(x) = \frac{1 - \tan x}{\sin x}$. Then $f'(x)$ is

a. $\csc x \cot x + \sec x \tan x$

b. $\csc x \cot x - \sec x \tan x$

c. $-\csc x \cot x + \sec x \tan x$

d. $-\csc x \cot x - \sec x \tan x$

e. $\csc x \tan x - \sec x \cot x$

ANSWER: d

89. Let $f(x) = \frac{\sin x}{1 - \cos^2 x}$. Then $f'(x)$ is

a. $1 + \cot^2 x$

b. $-\csc x$

c. $-\csc x \cot x$

d. $\csc x \cot x$

e. $\sec x \tan x$

ANSWER: c

90. Let $f(x) = \sin x \cos x$. Then $f'(x)$ is

a. $\sin^2 x - \cos^2 x$

b. $\cos^2 x - \sin^2 x$

c. 1

d. $2 \sin x \cos x$

e. $-2 \sin x \cos x$

ANSWER: b

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91. Let $f(x) = x^2 \cos x$. Then $f'(x)$ is

- a. $x(2 \sin x + x \cos x)$
- b. $x(2 \sin x - x \cos x)$
- c. $x(2 \cos x + x \sin x)$
- d. $x(2 \cos x - x \sin x)$
- e. $x(\sin x - 2 \cos x)$

ANSWER: d

92. Let $f(x) = 2 \cos x + x$. If $x \in [0, 2\pi]$, then f has a horizontal tangent line for each x in

- a. $\left\{ \frac{\pi}{6}, \frac{5\pi}{6} \right\}$
- b. $\left\{ \frac{5\pi}{6}, \frac{7\pi}{6} \right\}$
- c. $\left\{ \frac{\pi}{6}, \frac{11\pi}{6} \right\}$
- d. $\left\{ \frac{5\pi}{6}, \frac{11\pi}{6} \right\}$
- e. $\left\{ \frac{7\pi}{6}, \frac{11\pi}{6} \right\}$

ANSWER: a

93. Let $f(x) = \sin x - x$. If $x \in [0, 2\pi]$, then f has a horizontal tangent line for each x in

- a. $\left\{ \frac{\pi}{2} \right\}$
- b. $\{\pi\}$
- c. $\left\{ \frac{3\pi}{2} \right\}$
- d. $\{2\pi\}$
- e. $\{0, 2\pi\}$

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ANSWER: e

94. Let $f(x) = \cos x - 2x$. If $x \in [0, 2\pi]$, then f has a horizontal tangent line for each x in

- a. $\left\{\frac{\pi}{6}\right\}$
- b. $\left\{\frac{5\pi}{6}\right\}$
- c. $\left\{\frac{7\pi}{6}\right\}$
- d. $\left\{\frac{11\pi}{6}\right\}$
- e. $\emptyset$

ANSWER: e

95. Let $f(x) = \sin x - e^x$. If $x \in [0, 2\pi]$, then f has a horizontal tangent line for each x in

- a. $\left\{\frac{\pi}{2}\right\}$
- b. $\{\pi\}$
- c. $\left\{\frac{3\pi}{2}\right\}$
- d. $\{2\pi\}$
- e. $\{0\}$

ANSWER: e

96. Let $f(x) = \cos x + e^x$. If $x \in [0, 2\pi]$, then f has a horizontal tangent line for each x in

- a. $\left\{\frac{\pi}{2}\right\}$
- b. $\{\pi\}$
- c. $\left\{\frac{3\pi}{2}\right\}$

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d. $\{2\pi\}$

e. $\emptyset$

ANSWER: e

97. Let $f(x) = \cos x - e^x$. If $x \in [0, 2\pi]$, then f has a horizontal tangent line for each x in

a. $\left\{\frac{\pi}{2}\right\}$

b. $\{\pi\}$

c. $\left\{\frac{3\pi}{2}\right\}$

d. $\{2\pi\}$

e. $\emptyset$

ANSWER: e

98. Let $f(x) = \sin x - e^x$. If $x \in [-\pi, 3\pi]$, then f has a horizontal tangent line for each x in

a. 0

b. $\left\{\frac{\pi}{2}\right\}$

c. $\{\pi\}$

d. $\left\{\frac{3\pi}{2}\right\}$

e. $\{0, 2\pi\}$

ANSWER: a

99. Let $y = x \cos x$. Then y'' is

a. $2\sin x - x \cos x$

b. $2\cos x - x \sin x$

c. $2\sin x + x \cos x$

d. $2\cos x + x \sin x$

e. $-2\sin x - x \cos x$

ANSWER: e

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100. Let $y = x \sin x$. Then y'' is

- a. $2 \sin x - x \cos x$
- b. $2 \cos x - x \sin x$
- c. $2 \sin x + x \cos x$
- d. $2 \cos x + x \sin x$
- e. $-2 \sin x - x \cos x$

ANSWER: b

101. Let $y = e^x \sin x$. Then y'' is

- a. $2e^x \cos x$
- b. $2e^x \sin x$
- c. $-2e^x \cos x$
- d. $-2e^x \sin x$
- e. $e^x (\sin x + \cos x)$

ANSWER: a

102. Let $y = e^x \cos x$. Then y'' is

- a. $-2e^x \sin x$
- b. $-2e^x \cos x$
- c. $2e^x \sin x$
- d. $2e^x \cos x$
- e. $e^x (\sin x - \cos x)$

ANSWER: a

103. Let $y = 3 \sin x - 2 \cos x$. Then y'' is

- a. $-3 \sin x - 2 \cos x$
- b. $-3 \sin x + 2 \cos x$
- c. $3 \sin x - 2 \cos x$
- d. $3 \sin x + 2 \cos x$
- e. $2 \sin x - 3 \cos x$

ANSWER: b

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104. Let $y = 3 \sin x + 2 \cos x$. Then y'' is

- a. $-3 \sin x - 2 \cos x$
- b. $-3 \sin x + 2 \cos x$
- c. $3 \sin x - 2 \cos x$
- d. $3 \sin x + 2 \cos x$
- e. $2 \sin x - 3 \cos x$

ANSWER: a