Final Review 1810

Indicate the answer choice that best completes the statement or answers the question.

1. Which of the following is the correct graph of \( y = 3 - x \)?

a.  

b.  

c.  

d.  

Name: ____________________________  Class: ____________________________  Date: ____________
2. Sketch the graph of the equation. $y = |x + 3|$
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a. 

b. 

c. 

d. 

e. 

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3. Find the x- and y- intercepts of the graph of the equation \( y = \frac{x^2 - 81}{x + 9} \).

a. x- intercepts: (–9, 0); y- intercepts: (0, 9)
b. x- intercepts: (9, 0), (–9, 0); y- intercepts: (0, –9), (0, 9)
c. x- intercepts: (9, 0); y- intercepts: (0, –9)
d. x- intercepts: (0, –9), (0, 9); y- intercepts: (9, 0), (–9, 0)
e. x- intercepts: (81, 0); y- intercepts: (0, 81)

4. A small business recaps and sells tires. The business has a revenue function \( R(x) = 71x \) and a cost function \( C(x) = 600 + 65x \), where \( x \) represents the number of sets of four tires recapped and sold. Find the number of sets of recaps that must be sold to break even.

a. 100
b. 300
c. 6
d. 200
e. 65
5. Find the market equilibrium point for the following demand and supply functions below, where \( p \) is price per unit and \( q \) is the number of units produced and sold.
Demand: \( p = 420 - 7q \)
Supply: \( p = 13q + 80 \)

a. \( q = 25, p = 245 \)
b. \( q = 50, p = 70 \)
c. \( q = 34, p = 182 \)
d. \( q = 17, p = 301 \)
e. \( q = 21, p = 273 \)

6. Write the equation of the line passing through the given pair of points.

\((-3, 4)\) and \((4, 3)\)

a. \( y = x - 1 \)
b. \( y = \frac{-1}{7}x + \frac{25}{7} \)
c. \( y = -\frac{1}{7}x + 25 \)
d. \( y = -x + 7 \)
e. \( y = \frac{-1}{7}x + \frac{7}{25} \)

7. In 2004, a product has a value of $2,175. Over the next five years, its value will increase by $100 per year. Write a linear equation that gives the dollar value \( V \) in terms of the year \( t \). (Let \( t = 0 \) represent 2000.)

a. \( V = 100t + 2,175 \)
b. \( V = 100t - 2,175 \)
c. \( V = 100t + 1,775 \)
d. \( V = 100t + 2,575 \)
e. \( V = 100t - 1,775 \)
8. Complete the table and use the result to estimate the limit. Round your answer to six decimal places.

\[ \lim_{{x \to 10}} \frac{{x - 10}}{{x^2 + 10x - 110}} \]

<table>
<thead>
<tr>
<th>x</th>
<th>9.9</th>
<th>9.99</th>
<th>9.999</th>
<th>10.001</th>
<th>10.01</th>
<th>10.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>f(x)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. 0.047619  
b. 0.547619  
c. 0.422619  
d. 0.672619  
e. −0.327381

9. Find the x-values (if any) at which the function \( f(x) = 15x^2 + 13x - 3 \) is not continuous. Which of the discontinuities are removable?

a. continuous everywhere  
b. \( x = -3 \), removable  
c. \( x = -\frac{13}{30} \), removable  
d. \( x = -\frac{13}{30} \), removable  
e. both B and C

10. Use the limit definition to find the slope of the tangent line to the graph of \( f(x) = \sqrt{4x + 61} \) at the point (5, 9).

a. \( \frac{2}{9} \)  
b. \( \frac{2}{9} \)  
c. \( \frac{1}{9} \)  
d. \( \frac{1}{9} \)  
e. \( \frac{1}{5} \)
11. Find the derivative of the following function using the limiting process.

\[ f(x) = 2x^2 - 6x \]

a. 2  
b. 4x - 6  
c. 4x + 6  
d. 4x  
e. none of the above

12. For the function given, find \( f'(x) \).

\[ f(x) = x^5 - 9x - 3 \]

a. \( x^4 - 9 \)  
b. \( 5x^4 - 3 \)  
c. \( 5x^4 - 9 \)  
d. \( 5x^5 - 9x \)  
e. \( x^5 - 9x - 3 \)

13. The profit (in dollars) from selling \( x \) units of calculus textbooks is given by \( p = -0.05x^2 + 30x - 2,000 \). Find the additional profit when the sales increase from 146 to 147 units. Round your answer to two decimal places.

a. $15.35  
b. $30.00  
c. $15.45  
d. $30.80  
e. $30.60
14. When the price of a glass of lemonade at a lemonade stand was $1.75, 400 glasses were sold. When the price was lowered to $1.50, 500 glasses were sold. Assume that the demand function is linear and that the marginal and fixed costs are $0.10 and $25, respectively. Find the profit \( P \) as a function of \( x \), the number of glasses of lemonade sold.

a. \( P = -0.0025x^2 + 2.65x - 25 \)
b. \( P = 0.0025x^2 + 2.65x - 25 \)
c. \( P = -0.0025x^2 + 2.65x + 25 \)
d. \( P = 0.0025x^2 - 2.65x - 25 \)
e. \( P = 0.0025x^2 + 2.65x + 25 \)

15. Use the product Rule to find the derivative of the function \( f(x) = x(x^2 + 3) \).

a. \( f'(x) = 3x^2 + 3 \)
b. \( f'(x) = 3x^2 + 1 \)
c. \( f'(x) = x^2 + 3 \)
d. \( f'(x) = 3x^2 - 3 \)
e. \( f'(x) = 3x^2 - 1 \)

16. Find the derivative of the function.

\( f(x) = x^5(1 + 6x)^6 \)

a. \( f'(x) = x^5(1 + 6x)^4(5 + 66x) \)
b. \( f'(x) = 6x^5(1 + 6x)^5(5 + 66x) \)
c. \( f'(x) = x^4(1 + 6x)^6(5 + 66x) \)
d. \( f'(x) = x^4(1 + 6x)^5(5 + 66x) \)
e. \( f'(x) = x^4(1 + 6x)^5(5 + 6x) \)
17. You deposit $1,000 in an account with an annual interest rate of change $r$ (in decimal form) compounded monthly. At the end of 4 years, the balance is $A = 1,000 \left(1 + \frac{r}{12}\right)^{48}$. Find the rate of change of $A$ with respect to $r$ when $r = 0.08$. Round your answer to two decimal places.

a. $1,375.67$

b. $65,594.67$

c. $114.64$

d. $5,466.22$

e. $5,430.02$

18. Find the second derivative of the function.

$$f(x) = 3x^{\frac{4}{7}}$$

a. $f''(x) = -\frac{36}{49} x^{\frac{3}{7}}$

b. $f''(x) = \frac{4}{49} x^{\frac{-10}{7}}$

c. $f''(x) = \frac{147}{49} x^{\frac{-10}{7}}$

d. $f''(x) = -\frac{36}{49} x^{\frac{-10}{7}}$

e. None of the above

19. Find the third derivative of the function $f(x) = x^5 - 3x^4$.

a. $60x^2 - 72x$

b. $30x^2 - 36x$

c. $60x^2 - 72x^2$

d. $60x^2 - 36x$

e. $30x^2 - 72x$
20. Use the graph of \( y = f(x) \) to identify at which of the indicated points the derivative \( f'(x) \) changes from positive to negative.

a. (5, 6)
b. (-1, 2), (2, 4)
c. (2, 4), (5, 6)
d. (2, 4)
e. (-1, 2)

21. Both a function and its derivative are given. Use them to find all critical numbers.

\[
f(x) = x - 9x^3 + 6 \quad f'(x) = \frac{x^3 - 6}{x^3}
\]

a. \( x = 0 \)
b. \( x = 216 \)
c. \( x = 0, x = -102 \)
d. \( x = 0, x = 216 \)
e. \( x = -102, x = 216 \)
22. Identify the open intervals where the function \( f(x) = 5x^2 + 4x + 1 \) is increasing or decreasing.

- a. decreasing: \( (-\infty, -\frac{2}{5}) \); increasing: \( (-\frac{2}{5}, \infty) \)
- b. increasing: \( (-\infty, -\frac{2}{5}) \); decreasing: \( (-\frac{2}{5}, \infty) \)
- c. increasing on \( (-\infty, \infty) \)
- d. decreasing on \( (-\infty, \infty) \)
- e. none of the above

23. Identify the open intervals where the function \( f(x) = x\sqrt{22 - x^2} \) is increasing or decreasing.

- a. decreasing: \( (-\infty, \sqrt{11}) \); increasing: \( (\sqrt{11}, \infty) \)
- b. increasing: \( (-\sqrt{11}, \sqrt{11}) \); decreasing: \( (-\sqrt{22}, -\sqrt{11}) \cup (\sqrt{11}, \sqrt{22}) \)
- c. increasing: \( (-\infty, \sqrt{22}) \); decreasing: \( (\sqrt{22}, \infty) \)
- d. increasing: \( (-\sqrt{22}, -\sqrt{11}) \cup (\sqrt{11}, \sqrt{22}) \); decreasing: \( (-\sqrt{11}, \sqrt{11}) \)
- e. decreasing for all \( x \)

24. For the given function, find the critical numbers.

\[ y = \frac{x^4}{4} - \frac{x^3}{3} - 7 \]

- a. \( x = 0 \) and \( x = 1 \)
- b. \( x = 0 \) and \( x = 7 \)
- c. \( x = 0 \) and \( x = -7 \)
- d. \( x = 0 \) and \( x = -1 \)
- e. \( x = -1 \) and \( x = 1 \)
25. Find the open intervals on which the function \( f(x) = \frac{x}{x^2 + 8} \) is increasing or decreasing.

a. The function is increasing on the interval \(-\sqrt{8} < x < \sqrt{8}\), and decreasing on the intervals \(-\infty < x < -\sqrt{8}\) and \(\sqrt{8} < x < \infty\).

b. The function is increasing on the interval \(-\infty < x < -\sqrt{8}\), and decreasing on the intervals \(-\sqrt{8} < x < \sqrt{8}\) and \(\sqrt{8} < x < \infty\).

c. The function is increasing on the interval \(\sqrt{8} < x < \infty\), and decreasing on the intervals \(-\infty < x < -\sqrt{8}\) and \(\sqrt{8} < x < \sqrt{8}\).

d. The function is decreasing on the interval \(-\sqrt{8} < x < \sqrt{8}\), and increasing on the intervals \(-\infty < x < -\sqrt{8}\) and \(\sqrt{8} < x < \infty\).

e. The function is decreasing on the interval \(-\infty < x < -\sqrt{8}\), and increasing on the intervals \(-\sqrt{8} < x < \sqrt{8}\) and \(\sqrt{8} < x < \infty\).

26. A fast-food restaurant determines the cost model, \( C = 0.5x + 4500, \ 0 \leq x \leq 30000 \) and revenue model, \( R = \frac{1}{10000} (55000x - x^2) \) for \(0 \leq x \leq 30000\) where \(x\) is the number of hamburgers sold. Determine the intervals on which the profit function is increasing and on which it is decreasing.

a. The profit function is increasing on the interval \((25000, 30000)\) and decreasing on the interval \((0, 25000)\).

b. The profit function is increasing on the interval \((0, 22500)\) and decreasing on the interval \((22500, 30000)\).

c. The profit function is increasing on the interval \((0, 25000)\) and decreasing on the interval \((25000, 30000)\).

d. The profit function is increasing on the interval \((22500, 30000)\) and decreasing on the interval \((0, 22500)\).

e. The profit function is increasing on the interval \((0, 4500)\) and decreasing on the interval \((4500, 30000)\).

27. Find the \(x\)-values of all relative maxima of the given function.

\[ y = \frac{1}{3} x^3 - 5x^2 + 24x + 2 \]

a. \( x = 0 \)

b. \( x = 6 \)

c. \( x = 5 \)

d. \( x = 4 \)

e. no relative maxima
28. Find all relative minima of the given function.

\[ y = x^4 - 8x^3 + 16x^2 + 18 \]

a. (0, 18)
b. (2, 34)
c. (4, 18)
d. (0, 18), (4, 18)
e. no relative maxima

29. Find the x-value at which the absolute minimum of \( f(x) \) occurs on the interval \([a,b]\).

\[ f(x) = x^3 - 12x + 2, \quad [-6, 3] \]

a. \( x = -6 \)
b. \( x = -2 \)
c. \( x = 0 \)
d. \( x = 2 \)
e. \( x = 3 \)
30. Approximate the critical numbers of the function shown in the graph and determine whether the function has a relative maximum, a relative minimum, an absolute maximum, an absolute minimum, or none of these at each critical number on the interval shown.

   - a. The critical number $x = 0$ yields an absolute minimum and the critical number $x = 4$ yields an absolute maximum.
   - b. The critical number $x = 0$ yields an absolute maximum and the critical number $x = 4$ yields an absolute minimum.
   - c. Both the critical numbers $x = 0$ & $x = 4$ yield an absolute minimum.
   - d. Both the critical numbers $x = 0$ and $x = 4$ yield an absolute maximum.
   - e. Both the critical numbers $x = 0$ & $x = 4$ yield a relative minimum.

31. Graph a function on the interval $[-1, 3]$ having the following characteristics.
   
   - Absolute maximum at $x = 3$
   - Absolute minimum at $x = -1$
   - Relative minimum at $x = 2$
   - Relative maximum at $x = 0.2$

   a. 
   b.
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c.

d.

e.
32. Find all relative extrema of the function $x^4 - 12x^3 + 3$. Use the Second Derivative Test where applicable.

a. relative max: $f(18) = 34,995$; no relative min
b. relative max: $f(9) = 2,184$; no relative min
c. no relative max or min
d. relative min: $f(18) = 34,995$; no relative max
e. relative min: $f(9) = -2,184$; no relative max

33. Find all relative extrema of the function $f(x) = \frac{2}{x} + 5$. Use the Second Derivative Test where applicable.

a. relative max: $f(1) = 6$
b. relative min: $f(0) = 5$
c. no relative max or min
d. both A and B
e. none of the above

34. The graph of $f$ is shown in the figure. Sketch a graph of the derivative of $f$. 

a. 

b. 

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c.

d.

e.
35. **Production.** Suppose that the total number of units produced by a worker in $t$ hours of an 8-hour shift can be modeled by the production function $P(t) = 90t + 42t^2 - 2t^3$. Find the number of hours before the rate of production is maximized. That is, find the point of diminishing returns.

   a. $t = 0$
   b. $t = 7$
   c. $t = 5$
   d. $t = 8$
   e. $t = 15$

36. A rancher has 440 feet of fencing to enclose two adjacent rectangular corrals (see figure). What dimensions should be used so that the enclosed area will be a maximum?

![Diagram of two adjacent rectangular corrals with dimensions labeled $x$ and $y$.]

   a. $x = 55.00$ and $y = 73.33$
   b. $x = 11.00$ and $y = 132.00$
   c. $x = 22.00$ and $y = 146.67$
   d. $x = 73.33$ and $y = 55.00$
   e. $x = 33.00$ and $y = 88.00
37. A Norman window is constructed by adjoining a semicircle to the top of an ordinary rectangular window (see figure). Find the dimensions of a Norman window of maximum area if the total perimeter is 22 feet. Round your answers to two decimal places.

a. \( x = 6.16 \) feet and \( y = 3.08 \) feet
b. \( x = 3.08 \) feet and \( y = 7.04 \) feet
c. \( x = 2.05 \) feet and \( y = 8.36 \) feet
d. \( x = 5.16 \) feet and \( y = 4.37 \) feet
e. \( x = 7.16 \) feet and \( y = 1.8 \) feet
38. A function and its graph are given. Use the graph to find the horizontal asymptotes, if they exist, where \( A = 30 \). Confirm your results analytically.

\[
f(x) = \frac{10x^2}{(x - 2)^2}
\]

a. \( y = 5 \)
b. \( y = 10 \)
c. \( y = 2 \)
d. \( y = 1 \)
e. no horizontal asymptotes

39. Find the limit:

\[
\lim_{x \to 15^+} \frac{x - 9}{-x + 15}
\]

a. \( \infty \)
b. \( -\infty \)
c. 0
d. -1
e. 1
40. Find the limit.

\[
\lim_{x \to \infty} \frac{5x^2 - 5x - 12}{1 - 4x - 7x^2}
\]

a. \( \frac{5}{7} \)
b. 12
c. \(-12\)
d. \( \frac{5}{7} \)
e. \( \frac{5}{4} \)
41. Analyze and sketch a graph of the function $y = x\sqrt{16 - x}$.

a. 

b. 

c. 

d. 

e. 
42. The measurement of the circumference of a circle is found to be 54 centimeters, with a possible error of 0.7 centimeters. Approximate the percent error in computing the area of the circle.

a. 3.70 %
b. 1.30 %
c. 2.59 %
d. 5.19 %
e. 1.85 %

43. Suppose that the annual rate of inflation averages 4% over the next 10 years. With this rate of inflation, the approximate cost $C$ of goods or services during any year in that decade will be given by $C(t) = P(1.04)^t$, $0 \leq t \leq 10$ where $t$ is time in years and $P$ is the present cost. If the price of an oil change for your car is presently $25.95, estimate the price 10 years from now. Round your answer to two decimal places.

a. $39.95$
b. $40.41$
c. $41.95$
d. $43.41$
e. $38.41$

44. Sketch the graph of the function $f(x) = e^{5x}$.

a. b. c. d.
45. The average time between incoming calls at a switchboard is 3 minutes. If a call has just come in, the probability that the next call will come within the next \( t \) minutes is \( P(t) = 1 - e^{-\frac{t}{3}} \). Find the probability that the next call will come within the next \( \frac{5}{6} \) minute. Round your answer to two decimal places.

a. 24.25%
b. 2.43%
c. 175.75%
d. 26.48%
e. 5.97%
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46. Find the derivative of the following function.

\[ y = 9 - 3e^{-x^7} \]

a. \( y' = 21x^6e^{-x^7} \)

b. \( y' = -21x^6e^{-x^7} \)

c. \( y' = 3e^{-x^7} \)

d. \( y' = 3x^7e^{-x^7} \)

e. \( y' = -3x^7e^{-x^7} \)

47. Find an equation of the tangent line to the graph of \( y = e^{10x} \) at the point (0, 1).

a. \( y = x + 1 \)

b. \( y = \ln(10)x + 1 \)

c. \( y = 11x + 1 \)

d. \( y = 10x + 1 \)

e. \( y = 10x - 1 \)

48. Find \( f''(x) \), if \( f(x) = (5 + 7x)e^{-6x} \).

a. \( f''(x) = (96 - 252x)e^{-6x} \)

b. \( f''(x) = (-96 - 252x)e^{-6x} \)

c. \( f''(x) = -96(5 + 7x)e^{-6x} \)

d. \( f''(x) = -(23 + 42x)e^{-6x} \)

e. \( f''(x) = (96 + 252x)e^{-6x} \)

49. Simplify \( e^{\ln(9x^2)} \).

a. \( -x^2 \)

b. \( -9x^2 \)

c. \( 9x \)

d. \( 9x^2 \)

e. \( x^2 \)
50. Use the properties of logarithms to expand \( \ln\left(\frac{x^2 - 4}{x^9}\right)^2 \).

a. \( 2[\ln(x + 2) - \ln(x - 2) - 9\ln x] \)
b. \( 2[\ln(x + 2) + \ln(x - 2) + 9\ln x] \)
c. \( 2[\ln(x + 2) - \ln(x - 2) - \ln x] \)
d. \( 2[\ln(x + 2) + \ln(x - 2) + \ln x] \)
e. \( 2[\ln(x + 2) + \ln(x - 2) - 9\ln x] \)

51. Write the expression \( 2\ln(3) - \frac{1}{3}\ln(x^2 + 4) \) as the logarithm of a single quantity.

a. \( \ln\left[\frac{9}{(x^2 + 4)^3}\right] \)
b. \( \ln(3\sqrt[3]{x^2 + 4}) \)
c. \( \ln\left[\frac{8}{3\sqrt[3]{x^2 + 4}}\right] \)
d. \( \ln(8\sqrt[3]{x^2 + 4}) \)
e. \( \ln\left[\frac{9}{3\sqrt[3]{x^2 + 4}}\right] \)

52. Solve \( \left(15 - \frac{0.528}{22}\right)^4t = 50 \) for \( t \). Round your answer to four decimal places.

a. 1.4454
b. 0.3611
c. 2.6344
d. 0.3614
e. 2.7184
53. Find the derivative of the following function.

\[ y = \ln x^2 \]

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

54. Find the derivative of the function \( y = \ln \sqrt{x^2 + 3} \).

a. \( \frac{2x}{x^2 + 3} \)
b. \( \frac{x}{2x + 3} \)
c. \( \frac{1}{\sqrt{x^2 + 3}} \)
d. \( \frac{2x}{\sqrt{x^2 + 3}} \)
e. \( \frac{x}{x^2 + 3} \)
55. Find $y'$.

$$y = 8(\ln x)^{-4}$$

a. $\frac{-64}{x(\ln x)^5}$

b. $\frac{-16}{x(\ln x)^5}$

c. $\frac{-32}{x(\ln x)^5}$

d. $\frac{-32}{x(\ln x)^3}$

e. $\frac{-16}{x(\ln x)^3}$

56. Carbon-14 ($^{14}$C) dating assumes that the carbon on the Earth today has the same radioactive content as it did centuries ago. If this is true, then the amount of $^{14}$C absorbed by a tree that grew several centuries ago should be the same as the amount of $^{14}$C absorbed by a similar tree today. A piece of ancient charcoal contains only 24% as much of the radioactive carbon as a piece of modern charcoal. How long ago was the tree burned to make the ancient charcoal? (The half-life of $^{14}$C is 5715 years.) Round your answer to the nearest integer.

a. 2,776 years
b. 30,751 years
c. 2,781 years
d. 11,767 years
e. 11,772 years

57. The management of a factory finds that the maximum number of units a worker can produce in a day is 30. The learning curve for the number of units $N$ produced per day after a new employee has worked $d$ days is modeled by $N = 30 \cdot (1 - e^{-kd})$. After 20 days on the job, a worker is producing 19 units in a day. How many days should pass before this worker is producing 25 units per day?

a. about 36 days.
b. about 45 days.
c. about 30 days.
d. about 10 days.
58. Find the indefinite integral and check the result by differentiation.

\[ \int (-16x + 7) \, dx \]

a. \(-8x^2 + 7x + C\)

b. \(-16x^2 + 7x + C\)

c. \(-16x^2 - 7x + C\)

d. \(-16x + C\)

e. none of the above

59. Evaluate the integral \( \int \left( 11 + x^\frac{11}{2} \right) \, dx \).

a. \(11x + \frac{2}{13}x^{\frac{13}{2}} + C\)

b. \(11x + \frac{13}{2}x^{\frac{13}{2}} + C\)

c. \(\frac{121}{2} + \frac{2}{13}x^{\frac{13}{2}} + C\)

d. \(\frac{11}{2}x^{\frac{9}{2}} + C\)

e. \(\frac{11}{2}x^{\frac{13}{2}} + C\)

60. The graph of the derivative of a function is given below. Sketch the graphs of two functions that have the given derivative.
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1: \( f(x) = \frac{-x^2}{2} \)

2: \( f(x) = \frac{-x^2}{2} + 1 \)

c.

1: \( f(x) = -2x \)

2: \( f(x) = -2x + 1 \)

d.
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1: \( f(x) = \frac{1}{2}x^2 \)
2: \( f(x) = \frac{1}{2}x^2 + 2 \)

1: \( f(x) = 2x \)
2: \( f(x) = 2x + 1 \)

e.

1: \( f(x) = -2 \)
2: \( f(x) = -1 \)
61. Find the cost function for the marginal cost \( \frac{dC}{dx} = \frac{1}{10}x^4 + 21 \) and fixed cost of $2,800 (for \( x = 0 \)).

\( a. \ C(x) = \frac{1}{40}x^{10} + 21x + 2,800 \)

\( b. \ C(x) = \frac{1}{50}x^{10} + 2,800x + 21 \)

\( c. \ C(x) = \frac{1}{50}x^{10} + 21x + 2,800 \)

\( d. \ C(x) = \frac{1}{40}x^{10} + 2,800x + 21 \)

\( e. \ C(x) = \frac{1}{50}x^{10} + 21x + 2,800 \)

62. Find the particular solution that satisfies the differential equation \( f'(x) = \frac{1}{1}x - 14 \) and initial condition \( f(2) = -26 \).

\( a. \ f(x) = \frac{1}{3}x^2 - 14x \)

\( b. \ f(x) = \frac{1}{5}x^2 + 14x - 290 \)

\( c. \ f(x) = \frac{1}{2}x^2 - 14x \)

\( d. \ f(x) = \frac{1}{2}x^2 - 14x - 290 \)

\( e. \ f(x) = \frac{1}{3}x^2 + 14x \)

63. A ball is thrown vertically upwards from a height of 6 ft with an initial velocity of 40 ft per second.

How high will the ball go?

\( a. \ 29.03 \text{ ft} \)

\( b. \ 29.34 \text{ ft} \)

\( c. \ 30.89 \text{ ft} \)

\( d. \ 25.02 \text{ ft} \)

\( e. \ 32.12 \text{ ft} \)
64. Find the indefinite integral of the following function and check the result by differentiation.

\[ \int (1 + 7x)^7 \, dx \]

a. \( 8(1 + 7x)^8 + C \)
b. \( \frac{(1 + 7x)^8}{7} + C \)
c. \( \frac{(1 + 7x)^8}{8} + C \)
d. \( \frac{(1 + 7x)^8}{56} + C \)
e. none of the above

65. Find the indefinite integral of the following function and check the result by differentiation.

\[ \int s^8 \sqrt{4 + s^9} \, ds \]

a. \( \frac{(4 + s^9)^{3/2}}{36} + C \)
b. \( \frac{2(4 + s^9)^{3/2}}{45} + C \)
c. \( \frac{(4 + s^9)^{3/2}}{45} + C \)
d. \( \frac{2(4 + s^9)^{3/2}}{27} + C \)
e. none of the above
66. Evaluate the integral \( \int e^{7x} \, dx \).

a. \( \frac{1}{7} e^{7x} + C \)

b. \( 7e^{7x} + C \)

c. \( \frac{1}{8} e^{8x} + C \)

d. \( 7e^{6x} + C \)

e. \( \frac{1}{6} e^{6x} + C \)

67. Sketch the region whose area is given by the definite integral and then use a geometric formula to evaluate the integral.

\[ \int_{1}^{3} 5x \, dx \]

a. \(-20\)

b. 100

c. \(-100\)

d. 20

e. 7
68. Determine the area of the given region.

\[ y = 4x(1 - x) \]
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69. Evaluate the definite integral \( \int_{9}^{10} (x - 10)^9 \, dx \).

   a. \( \frac{1}{9} \)
   
   b. \( \frac{1}{11} \)
   
   c. \( -\frac{1}{9} \)
   
   d. \( \frac{1}{10} \)
   
   e. \( -\frac{1}{10} \)

70. The rate of depreciation of a building is given by \( D'(t) = 5,200(10 - t) \) dollars per year, \( 0 \leq t \leq 10 \). Use the definite integral to find the total depreciation over the first 10 years.

   a. $260,000
   
   b. $26,000
   
   c. $130,000
   
   d. $13,487
   
   e. $520,000
Answer Key

1. c
2. d
3. c
4. a
5. d
6. b
7. c
8. a
9. a
10. a
11. b
12. c
13. a
14. a
15. a
16. d
17. d
18. d
19. a
20. a
21. d
22. a
23. b
24. a
25. a
26. c
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27. d
28. d
29. a
30. c
31. a
32. e
33. b
34. e
35. b
36. a
37. a
38. b
39. b
40. a
41. a
42. c
43. e
44. c
45. a
46. a
47. d
48. e
49. d
50. e
51. e
52. d
53. b
54. e
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55. c
56. d
57. a
58. a
59. a
60. a
61. c
62. c
63. c
64. d
65. d
66. a
67. d
68. b
69. e
70. a