

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Simplify.

1) $4^x \cdot 2^{x/2}$

Enter your answer exactly as $2^{b/c}$.

1) _____

2) $2^x \cdot 8^x$

Enter your answer exactly as 2^a .

2) _____

3) $\frac{3^x}{6^x} \cdot 8^x \cdot \left(\frac{32}{4}\right)^x$

Enter your answer exactly as 2^a .

3) _____

4) $16^x \left(\frac{1}{8}\right)^x$

Enter your answer exactly as 2^a .

4) _____

5) $(2-x^2)(x+1)/x$

Enter your answer exactly in the form $2^{P(x)}$ where P is a polynomial.

5) _____

6) $\left(\frac{1}{4}\right)^{2x} \cdot \left(\frac{1}{27}\right)^{3x} \cdot \left(\frac{1}{64}\right)^{8x}$

Enter your answer exactly as $2^a \cdot 3^b$.

6) _____

7) $9^x \cdot 81^x \cdot 243^x$

Enter your answer exactly as 3^a .

7) _____

8) $3^{10x} \cdot 3^{11x} \cdot 3^{12x} \cdot 3^{-10x}$

Enter your answer exactly as 3^a .

8) _____

9) $\left(\frac{1}{9}\right)^{27x} \cdot \left(\frac{1}{3}\right)^{48x} \cdot \left(\frac{1}{81}\right)^{9x}$

Enter your answer as 3^a .

9) _____

10) $\left(\frac{1}{3^x}\right)^{3x}$

Enter your answer exactly in the form $3^{P(x)}$, where P(x) is a polynomial.

10) _____

11) $7^{-x} \cdot 14^x \cdot 49^{8x}$

Enter your answer exactly as $2^a \cdot 7^b$.

11) _____

12) $2^x \cdot 3^x \cdot 5^x \cdot 7^x$

Enter your answer exactly as a^b where a is an integer.

12) _____

13) $y^{4x} \cdot y^{6x} \cdot y^x \cdot y^4$

Enter your answer as $y^{P(x)}$ where P is a polynomial in x in standard form.

13) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

14) $(t^2)^x \cdot (t^4)^x \cdot (t^{1/3})^x$

A) $(t^8)^{x/3}$

B) $(t^{19/3x})^{3x}$

C) $(t^{19/3})^x$

D) $t^{(8/3)x}$

14) _____

15) $5^{2p} \cdot 4^p \cdot 9^{p/2}$

A) 300^p

B) 30^{5p}

C) $180^{(7/2)p}$

D) cannot be simplified

15) _____

16) $3^{2p} \cdot 9^p \cdot 4^p$

A) 18^{2p}

B) 18^{6p}

C) 300^p

D) cannot be simplified

16) _____

17) $16^{(p/2)} \cdot \left(\frac{1}{2}\right)^p \cdot \left(\frac{1}{2}\right)^p$

A) 1

B) $\left(\frac{4}{p}\right)^{(3/2)p + 1}$

C) 4^p

D) cannot be simplified

17) _____

18) $\left(\frac{1}{27}\right)^p \cdot \left(\frac{3}{27}\right)^p \cdot \left(\frac{1}{3}\right)^p$

A) $3^{(-5p - 1)}$

B) $\left(\frac{1}{3}\right)^{6p}$

C) $\frac{1}{3} \left(\frac{4}{27}\right)^p$

D) none of these

18) _____

19) If $\left(\frac{1}{4}\right)^{3x+1} = 2^6 - 2^x$, find x.

A) $x = -2$

B) $x = 3$

C) $x = \frac{1}{2}$

D) $x = \frac{1}{3}$

19) _____

20) If $9^t \cdot 3^{4t} \cdot 9^{-2t} = \sqrt{3}$, find t. 20) _____
 A) $t = \frac{1}{4}$ B) $t = -1$ C) $t = \frac{1}{2}$ D) $t = -2$

21) If $5^t + 5^t + 5^t = 75$, find t. 21) _____
 A) $t = 2$ B) $t = 5$
 C) $t = 25$ D) t cannot be determined

22) If $5^t \cdot 5^{4t} \cdot 5^{-2t} = 25^{(-1/2)t} + 1$, find t. 22) _____
 A) $t = \frac{4}{13}$ B) $t = -\frac{1}{2}$ C) $t = \frac{1}{2}$ D) $t = \frac{2}{7}$

23) If $\left(\frac{1}{9}\right)^{3x+4} = 81$, find x. 23) _____
 A) $x = -\frac{3}{2}$ B) $x = -\frac{1}{2}$ C) $x = -3$ D) none of these

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

24) Solve for x: $5^x \cdot 5^{2x} \cdot 5^{3x} = 25$. 24) _____
 Enter your answer exactly as $x = \frac{a}{b}$ in lowest terms.

25) Solve for x: $7^{-5} \cdot 49 \cdot 7^{x^2} \cdot 49^x = 1$. 25) _____
 Enter your answer exactly as $x = a, b$ ($a < b$).

26) Solve for x: $(5^x \cdot 25)^2 = 125 \cdot \left(\frac{1}{25}\right)^x$. 26) _____
 Enter your answer exactly as $x = \frac{a}{b}$ in lowest terms.

27) Solve for x: $2^4 - x \cdot 2^8 + 2x = 64$. 27) _____
 Enter your answer exactly as $x = a$ (with a an integer).

28) Solve for x: $3^{5x} \cdot 3^{x^2} \cdot 3^3 = 3^{-3}$. 28) _____
 Enter your answer exactly as $x = a, b$ ($a < b$).

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Solve the equation.

29) $3^x = 27$ 29) _____
 A) 4 B) 3 C) 9 D) 2

30) $4^{-x} = \frac{1}{16}$ 30) _____
 A) -2 B) 2 C) $\frac{1}{2}$ D) $\frac{1}{4}$

31) $5^{(10 - 2x)} = 625$ 31) _____
 A) 125 B) 5 C) -3 D) 3

32) $3^{(1 + 2x)} = 243$ 32) _____
 A) 2 B) -2 C) 81 D) 6

33) $3^{(6 - 3x)} = \frac{1}{27}$ 33) _____
 A) $\frac{1}{9}$ B) 9 C) 3 D) -3

34) $5^x = \frac{1}{25}$ 34) _____
 A) -2 B) $\frac{1}{5}$ C) 2 D) $\frac{1}{2}$

35) $3^{(6 + 3x)} = \frac{1}{27}$ 35) _____
 A) 3 B) -3 C) $\frac{1}{9}$ D) 9

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

36) The expression may be factored as shown. Find the missing factor. 36) _____
 $5^2 + h = 25(\quad)$
 Enter your answer as 5^a .

37) The expression may be factored as shown. Find the missing factor. 37) _____
 $2^{3x/2} + 2^{-x/2} = \sqrt{2^{-x}} (\quad)$
 Enter your answer as $2^a + b$.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 38) Estimate the slope of the curve $y = e^x$ at $x = 0$. 38) _____
- A) 0
 B) e^x
 C) e
 D) 1
 E) none of these

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

- 39) Find the slope of the tangent line to the curve $(x + e^{-x})^2$ at $(0, 1)$. 39) _____
 Enter just an integer.
- 40) Find the slope of the tangent line to the curve $y = \frac{e^x}{x}$ at $(1, e)$. 40) _____
 Enter just an integer.
- 41) Find the equation of the tangent line to the curve $y = \frac{e^x}{1 + e^x}$ at $\left(0, \frac{1}{2}\right)$. 41) _____
 Enter your answer in slope-intercept form with any fractions reduced as $\frac{a}{b}$.
- 42) Find the equation of the tangent line to the curve $y = xe^x$ at $(1, e)$ in slope-intercept form. 42) _____
- 43) Find the equation of the tangent line to the curve $y = \frac{1}{x}e^x$ at $(1, e)$ in the simplest form. 43) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Compute the given derivative.

- 44) $\frac{d}{dx} (2^x) \Big|_{x=-1}$; If necessary, use the fact that $\frac{d}{dx} (2^x) \Big|_{x=0} \approx 0.693$. 44) _____
- A) -0.5 B) 0.3465 C) 0.693 D) 1.386
- 45) $\frac{d}{dx} (e^x) \Big|_{x=-9}$ 45) _____
- A) $\frac{1}{e^9}$ B) $\frac{-9}{e^9}$ C) $e^{1/9}$ D) $9e^9$

Simplify.

$$46) \sqrt{\frac{e^{(1/2)x} \cdot e^{(3/2)x}}{e^{-2x}}}$$

46) _____

A) e^{-10x}

B) e^{-6x}

C) $e^{(1/2)x}$

D) $\frac{1}{e^{2x}}$

E) none of these

$$47) e^{1/2} \cdot 2e^2 \cdot 5e^3$$

47) _____

A) $11e^{11/2}$

B) $10e^3$

C) $10e^{11/2}$

D) cannot be simplified

$$48) \frac{1}{e^5} \cdot \frac{e^3}{2} \cdot e^{4x-1}$$

48) _____

A) $\frac{1}{2}e^{4x-3}$

B) $\frac{1}{2}e^{12x-8}$

C) $\frac{e^{12x-3}}{2e^5}$

D) cannot be simplified

$$49) (e^{2x})^3 \frac{5}{e^{1/2x}}$$

49) _____

A) $5e^{11/2x}$

B) $\frac{5e^{2x+3}}{e^{1/2x}}$

C) $5e^{3x}$

D) $5e^{3/2x+3}$

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

$$50) (e^{3x})^2 \cdot e^{-x}$$

50) _____

Enter your answer as e^a .

$$51) (e^x + e^{-x})^2$$

51) _____

Enter your answer exactly as $e^a + e^b + c$ ($b < a$).

$$52) (e^x + e^{-x})(e^x - e^{-x})$$

52) _____

Enter your answer exactly as $e^a - e^b$.

53) $\frac{(e^{1/2x})^{-3/4}}{e^{2x} - 5}$

53) _____

Enter your answer exactly as $e^{P(x)}$ where P is a polynomial with any fractions in the form $\frac{a}{b}$ in lowest terms.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

54) If $(e^x)^2 \cdot e^{2x} \cdot e = \frac{1}{e^2}$, find x.

54) _____

A) -2

B) $-\frac{3}{4}$

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

D) -1 or -2

Differentiate.

55) $(1 - 4e^x)x^2$

55) _____

A) $-8e^x - 1$

B) $-8e^x \cdot x$

C) $2x - 8xe^x - 4x^3e^x - 1$

D) $2x - 8xe^x - 4x^2e^x$

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

56) _____

A) $\frac{2e^x}{(e^x + 1)^2}$

B) 1

C) 0

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

57) e^{3x}

57) _____

A) e^{3x}

B) $3e^{3x}$

C) $3x$

D) $\frac{1}{3}e^{3x}$

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

58) $f(x) = (1 + x^2)e^x$

58) _____

Enter your answer exactly in the form $(P(x))e^a$ where P is a polynomial.

59) $f(x) = \frac{e^x}{1 + x^2}$

59) _____

Enter your answer exactly as $\frac{(P(x))e^a}{(Q(x))^n}$ where P and Q are polynomials.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

60) Find the first and second derivatives of $f(x) = \frac{1 - 2x}{e^x}$. 60) _____

A) $f'(x) = 4xe^x - 2e^x$
 $f''(x) = 4xe^x + 2e^x$

B) $f'(x) = \frac{3 - 2x}{e^x}$
 $f''(x) = \frac{2x - 5}{e^x}$

C) $f'(x) = 2xe^x - 3e^x$
 $f''(x) = 2xe^x - e^x$

D) $f'(x) = \frac{2x - 3}{e^x}$
 $f''(x) = \frac{5 - 2x}{e^x}$

Differentiate.

61) $y = 6xe^x - 6e^x$ 61) _____
 A) $6xe^x$ B) $6x$ C) $6xe^x + 12e^x$ D) $6e^x$

62) $y = (x^2 - 2x + 6)e^x$ 62) _____
 A) $\left(\frac{x^3}{3} + 4x + 6\right)e^x$ B) $(x^2 + 4x + 4)e^x$
 C) $(x^2 + 4)e^x$ D) $(2x - 2)e^x$

63) $y = \frac{6e^x}{2e^x + 1}$ 63) _____
 A) $\frac{6e^x}{(2e^x + 1)}$ B) $\frac{6e^x}{(2e^x + 1)^2}$ C) $\frac{6e^x}{(2e^x + 1)^3}$ D) $\frac{e^x}{(2e^x + 1)^2}$

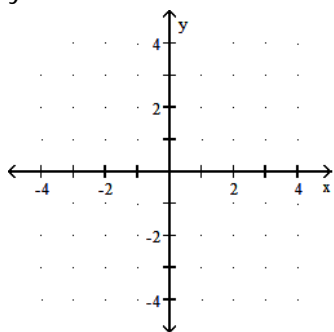
64) $y = \frac{e^x}{2x^2 + 10}$ 64) _____
 A) $\frac{e^{x-1}(2x^2 + 10) - 4xe^x}{(2x^2 + 10)^2}$ B) $\frac{e^x(2x^2 - 4x + 10)}{(2x^2 + 10)^2}$
 C) $e^x + \frac{2x^2 - 4x + 10}{(2x^2 + 10)^2}$ D) $\frac{e^{x-1}(2x^2 - 4x + 10)}{(2x^2 + 10)^2}$

65) Which of the following properties are true of the graph of $y = 10e^{2x}$? 65) _____
 (I) It is concave up.
 (II) The y-intercept is (0, 2).
 (III) It has a minimum at $x = 0$.
 (IV) y is positive for $x \geq 0$ and negative for $x < 0$.
 A) I and III B) III and IV C) I and II D) I only

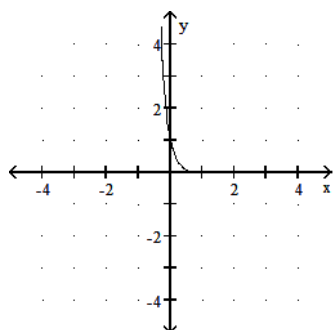
Sketch the graph of the function.

66) $y = e^{5x}$

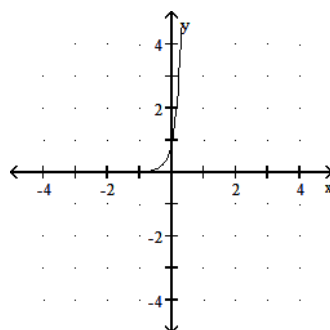
66) _____



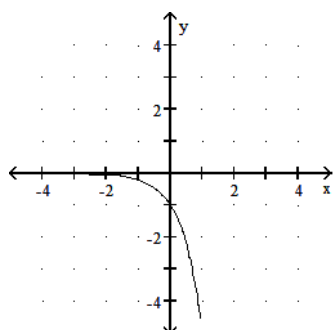
A)



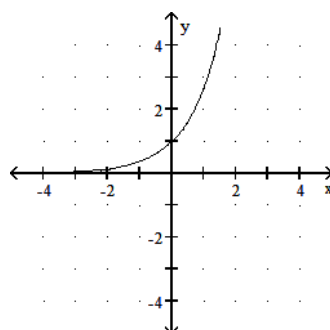
B)



C)

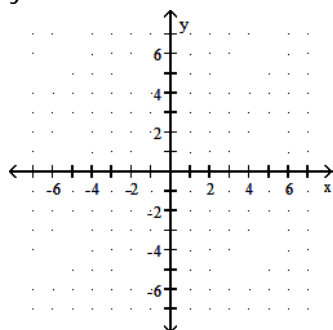


D)

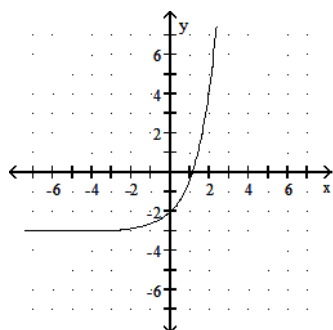


67) $y = 3 - e^x$

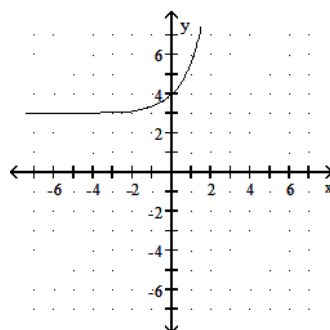
67) _____



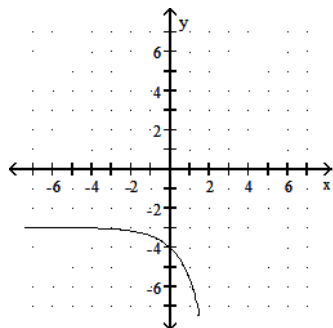
A)



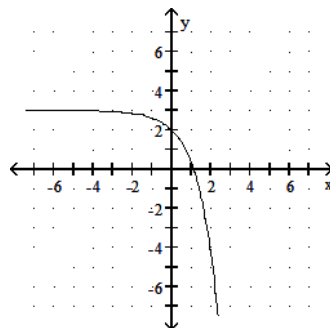
B)



C)

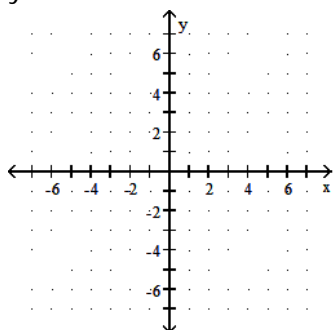


D)

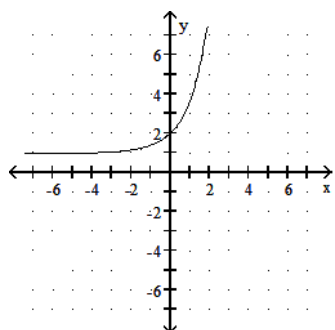


68) $y = e^x - 1$

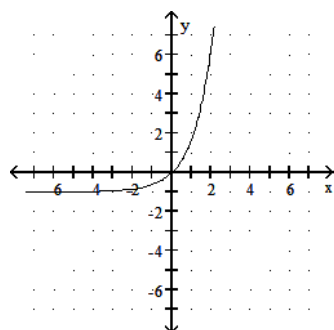
68) _____



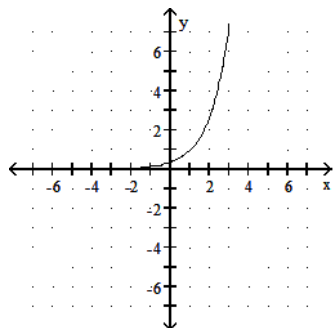
A)



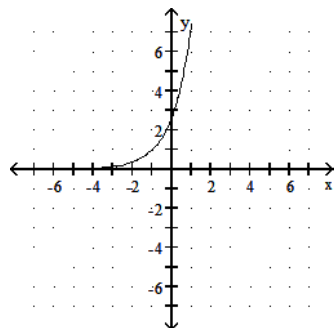
B)



C)

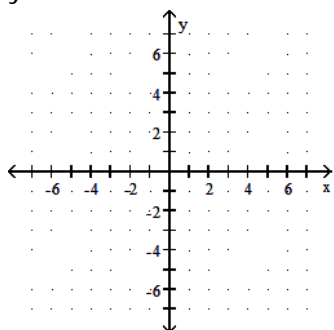


D)

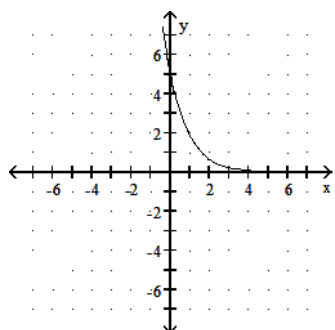


69) $y = 5e^{-x}$

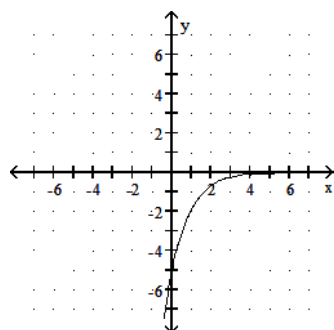
69) _____



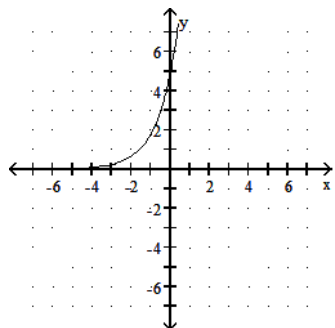
A)



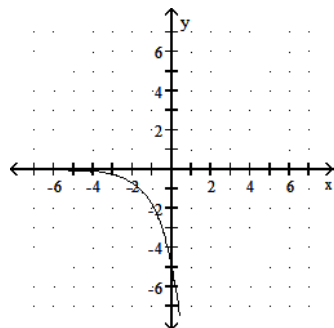
B)



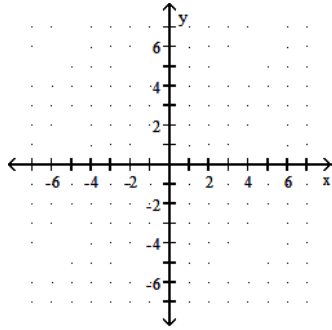
C)



D)

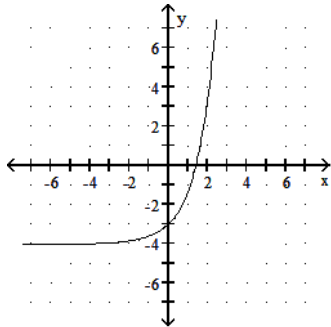


70) $y = e^{-x} - 4$

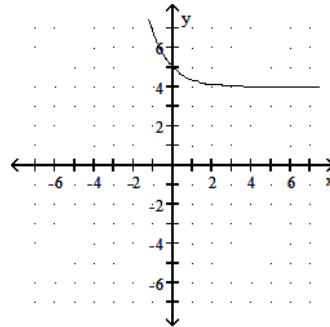


70) _____

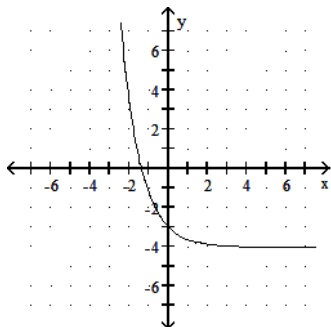
A)



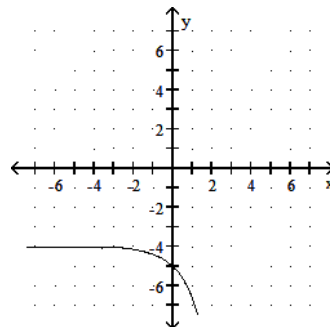
B)



C)



D)



Differentiate.

71) $f(x) = e^{5x}$

A) $5e^{5x}$

B) $5e^x$

C) e^{5x}

D) $\frac{1}{5}e^{5x}$

71) _____

72) $f(x) = e^4 - 2x$

A) $-2 \ln(4 - 2x)$

B) e^{-2}

C) $4e^4 - 2x$

D) $-2e^4 - 2x$

72) _____

- 73) $f(x) = 4e^{x^2}$ 73) _____
 A) $8xe^{2x}$ B) $8xe^{4x^2}$ C) $8xe$ D) $8xe^{x^2}$
- 74) $f(x) = e^{5x/8}$ 74) _____
 A) $e^{5x/8}$ B) $\frac{5}{8}e^{5x/8} - 1$ C) $\frac{5}{8}xe^{5x/8}$ D) $\frac{5}{8}e^{5x/8}$
- 75) $f(x) = 6e^{-8x}$ 75) _____
 A) $48e^{-8x}$ B) $6e^{-8x}$ C) $-48e^{-8x}$ D) $-8e^{-8x}$
- 76) $f(x) = -4e^{8x}$ 76) _____
 A) $-32e^{8x}$ B) $-4e^{8x}$ C) $-32e^x$ D) $8e^{8x}$
- 77) $f(x) = 3 - e^{-x}$ 77) _____
 A) $3 - e^{-x}$ B) e^{-x} C) $-e^{-x}$ D) $3 + e^{-x}$
- 78) $f(x) = \frac{1}{9}e^{9x}$ 78) _____
 A) $\frac{1}{9}e^{9x}$ B) $e^{x/9}$ C) $9e^{9x}$ D) e^{9x}
- 79) $f(x) = e^{2x^2} + x$ 79) _____
 A) $4xe^{2x^2} + 1$ B) $4xe + 1$ C) $4xe^{2x} + 1$ D) $4xe^{x^2} + 1$
- 80) $f(x) = e^3 - 10x$ 80) _____
 A) $3e^3 - 10x$ B) $-10e^3 - 10x$ C) e^{-10} D) $-10 \ln(3 - 10x)$
- 81) $f(x) = 8xe^x - 8e^x$ 81) _____
 A) $8e^x$ B) $8xe^x$ C) $8xe^x + 16e^x$ D) $8x$
- 82) $f(x) = \frac{e^{-x} + 1}{e^x}$ 82) _____
 A) $\frac{-e^x + 2}{e^{2x}}$ B) $\frac{e^x - 2}{e^{2x}}$ C) $\frac{e^x + 2}{e^{2x}}$ D) $\frac{-e^x - 2}{e^{2x}}$
- 83) $f(x) = \frac{e^{(3-2x)}}{3}$ 83) _____
 A) $-\frac{e^{3-2x}}{6}$ B) $\frac{e^4 - 2x}{12}$ C) e^{-2x} D) $-\frac{2(e^3 - 2x)}{3}$

$$84) f(x) = (6e^{2x} - x)^3$$

$$A) 3(12xe^{2x} - 1 - 1)^2$$

$$C) 3(6e^{2x} - x)^2(12e^{2x} - 1)$$

$$B) 3(6e^{2x} - x)^2(12e^{2x})$$

$$D) 3(12e^x - 1)^2$$

84) _____

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

$$85) f(x) = e^{2x} - x^2$$

Enter your answer exactly as $ae^b - c$

85) _____

$$86) f(x) = (x^3 + 1)e^{-4x}$$

Enter your answer exactly as just $e^a(P(x))$ where P is a polynomial in x in standard form.

86) _____

$$87) f(x) = e^{3e^{2x}}$$

Enter your answer exactly as just $ae^{P(e^x)}$ where P is a polynomial in e^x in standard form.

87) _____

$$88) f(x) = 4e^{3x}$$

Enter your answer exactly as just ae^b .

88) _____

$$89) f(x) = \frac{e^x + 1}{e^x - 1}$$

Enter your answer exactly as just $\frac{P(e^x)}{(Q(e^x))^n}$ where P and Q are polynomials in e^x in standard form.

89) _____

$$90) f(x) = e^x + e^{2x} + \frac{1}{e^{-4x}}$$

Enter your answer exactly as just $P(e^x)$ where P is a polynomial in e^x in standard form.

90) _____

$$91) f(x) = x^3e^{-x^3}$$

Enter your answer exactly as just $e^{P(x)}(Q(x))$ where P and Q are polynomials in x in standard form.

91) _____

$$92) f(x) = e^{1/x}$$

Enter your answer exactly as just a^be^{cd} .

92) _____

$$93) f(x) = \frac{x}{e^x}$$

Enter your answer exactly as just $e^a(P(x))$ where P is a polynomial in x in standard form.

93) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 94) Let $y = e^{e^{2x} + 1}$. What is $\frac{dy}{dx}$? 94) _____
- A) $2e^{2x + 1}$
 B) $e^{2x + 1}$
 C) ee^2
 D) e^2
 E) none of these

- 95) Find the values of x at which the function $f(x) = e^{-2x} + 2x$ has a possible relative maximum or minimum point. 95) _____
- A) maximum at $x = \frac{0.69}{2}$
 B) minimum at $x = 0$
 C) maximum at $x = \frac{e}{2}$
 D) There are no relative maximum/minimum points.
 E) none of these

Solve the problem.

- 96) The sales in thousands of a new type of product are given by $S(t) = 30 - 80e^{-0.8t}$, where t represents time in years. Find the rate of change of sales at the time when $t = 8$. 96) _____
- A) 0.1 thousand per year
 B) 37,773.2 thousand per year
 C) -37,773.2 thousand per year
 D) -0.1 thousand per year
- 97) A company's total cost, in millions of dollars, is given by $C(t) = 120 - 80e^{-t}$ where $t =$ time in years. Find the marginal cost when $t = 2$. 97) _____
- A) 10.83 million dollars per year
 B) 21.65 million dollars per year
 C) 7.97 million dollars per year
 D) 16.24 million dollars per year
- 98) Suppose that the amount in grams of a radioactive substance present at time t (in years) is given by $A(t) = 800e^{-0.86t}$. Find the rate of change of the quantity present at the time when $t = 5$. 98) _____
- A) -72.7 grams per year
 B) -9.3 grams per year
 C) 9.3 grams per year
 D) 72.7 grams per year
- 99) If $e^{-x} = 6$, write x in terms of the natural logarithm. 99) _____
- A) $\ln -6$
 B) $\ln 6$
 C) $-\ln 6$
 D) 6
- 100) If $\ln x = -3.6$, write x using the exponential function. 100) _____
- A) 3.6
 B) $e^{3.6}$
 C) $\frac{1}{e^{3.6}}$
 D) $\frac{1}{e^{-3.6}}$

Simplify.

101) $\ln(x^2 - 2) + e \cdot \ln(x^2 - 2)$

A) $(1 + e)\ln(x^2 - 2)$

C) $\ln(x^2 - 2) + (x^2 - 2)$

B) $\pm\sqrt{3}$

D) $(\ln + 1)(x^2 - 2)$

101) _____

102) $e^{2 \ln 5} + \ln(e^x \cdot e^4)$

A) $10 + x \cdot e^4$

B) $10 + 4x$

C) $25 + 4x$

D) $29 + x$

102) _____

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

103) $e^{\ln 3} + \ln(2x)$

Enter just a standard polynomial in x.

103) _____

104) $\ln e^{2x} - \ln e^{-x/2}$

Enter just a standard polynomial in x with any fractions reduced of form $\frac{a}{b}$.

104) _____

105) $e^{\ln 2x}$

Enter just a standard polynomial in x.

105) _____

106) $e^x + 2 \ln x$

Enter your answer exactly as $a^b e^c$.

106) _____

107) $e^{\ln x} - 2 \ln y$

Enter just a standard polynomial in x.

107) _____

108) $\ln\left(\frac{1}{e^x}\right)$

Enter just a standard polynomial in x.

108) _____

109) $e^{2 \ln x}$

Enter just a standard polynomial in x.

109) _____

110) $\ln e^{1/x}$

Enter your answer exactly in the form a^b where b is an integer.

110) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

111) $\ln e^{1/5}$

A) 5

B) $5e$

C) $\frac{1}{5}$

D) $\frac{1}{5}e$

111) _____

112) $\ln e^8$ 112) _____
 A) 8 B) $8 \ln e$ C) 1 D) e^8

Simplify the expression.

113) $\ln(e^6 \ln e)$ 113) _____
 A) e^6 B) $\ln(6)$ C) 6 D) $6 \ln(6)$

114) $\ln(e^{-9} e^8)$ 114) _____
 A) e^{-72} B) -1 C) -72 D) $\ln(-1)$

115) $e^{-2 \ln 4}$ 115) _____
 A) e^2 B) 2 C) $\frac{1}{16}$ D) 16

Solve for x.

116) $3 + \ln x = 0$ 116) _____
 A) $x = \ln\left(\frac{1}{3}\right)$
 B) $x = -e^3$
 C) $x = \frac{1}{e^3}$
 D) $x = \ln(-3)$
 E) none of these

117) $2 - \ln(x + 3) = \ln 4$ 117) _____
 A) $x = \ln 4 - 1$ B) $x = \frac{1}{4}e^2 - 3$ C) $x = -3$ D) $x = 2e$

118) $\ln x^3 + 3 \ln x = 0$ 118) _____
 A) $x = e^3$ B) $x = \sqrt{3}$ C) $x = 0, \pm\sqrt{3}$ D) $x = 1$

119) $e^{(x^2 + 9)} \cdot e^{(6x)} = 1$ 119) _____
 A) $x = \ln \frac{1}{2}$ B) $x = \pm\sqrt{3}$ C) $x = 0$ D) $x = -3$

120) $e^{4x^2} + e^{(2x)^2} = 6$ 120) _____
 A) $x = \pm \frac{\sqrt{\ln 3}}{2}$ B) $x = \frac{1}{2} \ln \frac{1}{2}$ C) $x = \pm \frac{1}{2} \sqrt{\ln 6}$ D) $x = \pm \frac{1}{4} \sqrt{\ln 6}$

121) $e^{1+x^2} = e^{x+7}$ 121) _____
 A) $x = -2, -1$ B) $x = 1, 2$ C) $x = -2, 3$ D) none of these

122) $e^{x^2 - 4} = 3$ 122) _____
 A) $\pm(2 + \sqrt{\ln 3})$ B) $\pm\sqrt{4 + \ln 3}$ C) $2 \pm \sqrt{\ln 3}$ D) none of these

123) $2 \ln x + \ln \frac{1}{x} = 3$ 123) _____
 A) $1 + e^2$
 B) $\pm\sqrt{\ln 3}$
 C) $\ln 3$
 D) e^3
 E) none of these

124) $\ln(x + 1) = 2 + \ln x$ 124) _____
 A) $e + 1$
 B) $\frac{1}{e^2 - 1}$
 C) $e^2 - 1$
 D) $e - 1$
 E) none of these

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

125) $2e^{3x + 1} = e^2$ 125) _____
 Enter your answer exactly as $x = \frac{a - \ln b}{c}$.

126) $\ln x^2 + (\ln x)^2 = 0$ 126) _____
 Enter your answer exactly as $x = a, b$ ($a < b$).

127) $e^{\ln(3x)} - \ln(e^4) = 1$ 127) _____
 Enter your answer exactly as $x = \frac{a}{b}$.

128) $4e^{3x + 2} = 20$ 128) _____
 Enter your answer exactly as $x = \frac{\ln a - b}{c}$.

129) $2e^{x + 1} + 2 = 6$ 129) _____
 Enter your answer exactly as just $a \pm \ln b$.

130) $e^x - 1 + 6 = 4e^{x - 1}$ 130) _____
 Enter your answer exactly as just $a \pm \ln b$.

131) $2 \ln(x + 1) - \ln x^2 = 8$

Enter your answer exactly as just $\frac{a}{e^b - c}$.

131) _____

132) $\ln(1 - 2x) = 2 \ln(1 - x)$

Enter just a real number.

132) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

133) Find k such that $3^{-x/2} = e^{kx}$ for all x .

A) $-\frac{1}{2} \ln 3$

B) $\ln -\frac{3}{2}$

C) $\frac{1}{2} \ln 3$

D) $\ln 3$

133) _____

Solve the equation for x .

134) $e^{0.92x} = 9$

A) $x = 0.92 \ln 9$

B) $x = \frac{\ln 9}{0.92}$

C) $x = \frac{0.92}{\ln 9}$

D) $x = \frac{\ln 10}{0.92}$

134) _____

135) $\ln x = 5$

A) $x = e^5$

B) $x = \ln 5$

C) $x = 100,000$

D) $x = 5e$

135) _____

136) $e^x = 196$

A) $x = \ln 196$

B) $x = \log 196$

C) $x = 196e$

D) $x = \log_3 196$

136) _____

137) $e^x = 0.98$

A) $x = \ln 0.98$

B) $x = \log_3 0.98$

C) $x = -\ln 0.98$

D) $x = \log 0.98$

137) _____

138) $e^{-x} = 634$

A) $x = -\ln 634$

B) $x = -\log 634$

C) $x = \ln 634$

D) $x = \ln -634$

138) _____

139) $e^{-x} = \frac{1}{3}$

A) $x = -\ln 1$

B) $x = -\ln \frac{1}{3}$

C) $x = -\ln 3$

D) $x = \ln \frac{1}{3}$

139) _____

140) $8 \ln x - 4 = 9$

A) $x = \ln \frac{13}{8}$

B) $x = e^{13/8}$

C) $x = \frac{1}{8}e^{13}$

D) $x = \frac{1}{8} \ln 13$

140) _____

141) $2 \ln 5x = 8$

A) $x = \frac{1}{5} \ln 4$

B) $x = \frac{1}{10}e^8$

C) $x = e^{4/5}$

D) $x = \frac{1}{5}e^4$

141) _____

- 142) At what value of x could the function $f(x) = \frac{\ln x + x}{x}$ have a possible relative maximum or minimum?
- A) $x = 1$
 B) $x = \frac{1}{e}$
 C) $x = e^2$
 D) $x = e$
 E) none of these

142) _____

Solve the problem.

- 143) A company begins an advertising campaign in a certain city to market a new product. The percentage of the target market that buys the product is a function of the length of the advertising campaign. The company estimates this percentage as $1 - e^{-0.04t}$ where t = number of days of the campaign. The target market is estimated to be 1,000,000 people and the price per unit is \$0.40. The cost of advertising is \$5000 per day. Find the length of the advertising campaign that will result in the maximum profit.
- A) 36 days B) 24 days C) 29 days D) 26 days

143) _____

- 144) The demand function for a certain product is given by

144) _____

$$D(p) = 200e^{-0.25p},$$

where p is price per unit. Recall that total revenue is given by $R(p) = pD(p)$. At what price per unit p will the revenue be maximum?

- A) \$4 B) \$2 C) \$8 D) \$3

Differentiate.

145) $y = \ln 3x$

145) _____

- A) $-\frac{1}{x}$ B) $-\frac{1}{3x}$ C) $\frac{1}{x}$ D) $\frac{1}{3x}$

146) $y = \ln (x - 9)$

146) _____

- A) $\frac{1}{x - 9}$ B) $-\frac{1}{x + 9}$ C) $\frac{1}{x + 9}$ D) $\frac{1}{9 - x}$

147) $y = \ln 8x^2$

147) _____

- A) $\frac{2x}{x^2 + 8}$ B) $\frac{1}{2x + 8}$ C) $\frac{16}{x}$ D) $\frac{2}{x}$

148) $y = \ln (5 + x^2)$

148) _____

- A) $\frac{10}{x}$ B) $\frac{2x}{x^2 + 5}$ C) $\frac{1}{2x + 5}$ D) $\frac{2}{x}$

- 149) $y = \ln(6x^3 - x^2)$ 149) _____
 A) $\frac{18x - 2}{6x^3 - x}$ B) $\frac{18x - 2}{6x^2}$ C) $\frac{18x - 2}{6x^2 - x}$ D) $\frac{6x - 2}{6x^2 - x}$
- 150) $y = \ln \frac{x}{8}$ 150) _____
 A) $\frac{1}{8x}$ B) $\frac{1}{x}$ C) $\frac{8}{x}$ D) $\frac{1}{x} - \ln 8$
- 151) $y = \ln(\ln 5x)$ 151) _____
 A) $\frac{1}{5x}$ B) $\frac{1}{x \ln 5x}$ C) $\frac{1}{x}$ D) $\frac{1}{\ln 5x}$
- 152) $y = e^x \ln x$ 152) _____
 A) $\frac{e^x(\ln x + x)}{x}$ B) $\frac{e^x}{x}$ C) $e^x \ln x$ D) $\frac{e^x(x \ln x + 1)}{x}$
- 153) $y = \frac{\ln x}{x^7}$ 153) _____
 A) $\frac{1 - 7 \ln x}{x^{14}}$ B) $\frac{1 - 7 \ln x}{x^8}$ C) $\frac{1 + 7 \ln x}{x^{14}}$ D) $\frac{7 \ln x - 1}{x^8}$
- 154) $y = \frac{e^x}{\ln x}$ 154) _____
 A) $\frac{x e^x \ln x - e^x}{x \ln^2 x}$ B) $x e^x$ C) $\frac{e^x + x e^x \ln x}{x}$ D) $\frac{e^x - x e^x \ln x}{x \ln^2 x}$
- 155) $y = \ln(9 + x^2)$ 155) _____
 A) $\frac{18}{x}$ B) $\frac{1}{2x + 9}$ C) $\frac{2x}{x^2 + 9}$ D) $\frac{2}{x}$
- 156) $\ln\left(\frac{x+2}{x-1}\right)$ 156) _____
 A) $\frac{x-1}{x+2}$
 B) $\frac{(x-1)}{(x+2)(x+3)}$
 C) $\frac{1}{x+2} - \frac{1}{x-1}$
 D) $\frac{3x}{(x+2)(x-1)}$
 E) none of these

157) $(\ln(x^2 + 2))^3$

157) _____

A) $e^{\left(\frac{1}{x^2 + 2}\right)^2} \cdot 2x$

B) $\frac{6x}{x^2 + 2} (\ln(x^2 + 2))^2$

C) $3(\ln(2x))^2$

D) $\frac{1}{(\ln(x^2 + 2))^3} \cdot 2x$

158) $e^{x^2} + 2 \ln(x^e)$

158) _____

A) $x^2 e^{x^2} - 1 + 2e^{\frac{1}{x^e}} \cdot x^e - 1$

B) $2e^x + 2\frac{1}{\ln(x^e)} \cdot x^e$

C) $2xe^{x^2} + 2e^{\frac{1}{x}}$

D) none of these

159) $\sqrt{\ln 3x}$

159) _____

A) $\frac{1}{2x\sqrt{\ln 3x}}$

B) $\frac{1}{6x}$

C) $\frac{1}{6x\sqrt{\ln 3x}}$

D) $\frac{1}{3x\sqrt{\ln 3x}}$

E) none of these

160) $x^3 \ln x$

160) _____

A) $3x^2 \ln x$

B) $3x^2 \ln x + x^2$

C) $(3x^2 + 1) \ln x$

D) $x^2 \ln x + x^2$

E) none of these

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

161) $\ln(2x^2 + 1)$

161) _____

Enter your answer exactly as $\frac{P(x)}{Q(x)}$ where P and Q are polynomials in x in standard form.

162) $\frac{\ln x}{x^3}$

162) _____

Enter your answer exactly as just $\frac{a \pm b \ln c}{P(x)}$ where P is a polynomial in x in standard form.

- 163) $x^4 \ln(x^2 + 1)$ 163) _____
 Enter your answer exactly as $\frac{P(x)}{Q(x)} \pm R(x) \ln(S(x))$ where P, Q, R, and S are polynomials in standard form.
- 164) $e^x \ln 2x$ 164) _____
 Enter your answer exactly as $e^a \ln b \pm \frac{e^c}{d}$.
- 165) $e^{(\ln x)^2}$ 165) _____
 Enter your answer exactly as $e^{(\ln a)^b \frac{c \ln d}{f}}$.
- 166) $(\ln x)^5$ 166) _____
 Enter your answer as $\frac{P(\ln x)}{Q(x)}$ where P is a polynomial in $\ln x$ and Q is a polynomial in x.
- 167) $f(x) = (\ln x)^4$ 167) _____
 Enter your answer as just $\frac{P(\ln x)}{Q(x)}$ where P is a polynomial in $\ln x$ and Q is a polynomial in x.
- 168) $(x + 3 \ln x)^4$ at $x = 1$ 168) _____
 Enter just an integer.
- 169) $\frac{\ln 3x}{\ln x}$ 169) _____
 Enter your answer as just $\frac{\pm \ln c}{Q(x)R(\ln x)}$ where P and R are polynomials in $\ln x$ and Q is a polynomial in x, all in standard form.
- 170) $f(x) = \frac{\ln x}{e^x}$ at $x = 1$ 170) _____
 Enter your answer as just e^a .
- 171) $f(x) = x \ln(2x - x^2)$ at $x = 1$ 171) _____
 Enter your answer as just a real number.
- 172) $\ln(x^4 - x^3 + 2x + 1)$ 172) _____
 Enter your answer as just $\frac{P(x)}{Q(x)}$ where P and Q are both polynomials in x in standard form.

173) $e^{x^2} \ln(1 + x^2)$ at $x = 1$
Enter your answer as just $e(a + \ln b)$

173) _____

174) $\ln \frac{1 + x^2}{2x + 5}$ at $x = 1$

174) _____

Enter your answer as just a reduced fraction $\frac{a}{b}$.

175) $\sqrt{1 + \ln(2 - x)}$ at $x = 1$

175) _____

Enter your answer as just a reduced fraction $\frac{a}{b}$.

176) $\ln(e^x + e^{-x})$ at $x = 0$
Enter just an integer.

176) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

177) Find the slope of the graph of $y = \ln(2x + 3)^{1/2}$ at the point $(3, \ln 3)$.

177) _____

A) $\frac{\ln 3}{2}$

B) $\frac{1}{\ln 3}$

C) $\frac{1}{2(\ln 3) + 3}$

D) $\frac{1}{9}$

178) Find an equation of the tangent line to the graph of $y = x^3 \ln(-2x)$ at $x = -1$.

178) _____

A) $y - 1 = 4(x - \ln 2)$

B) $y = (x + \ln 2) - 1$

C) $y + \ln 2 = 4(x - 1)$

D) $y = (1 + 3 \ln 2)(x + 1) - \ln 2$

179) Find an equation of the tangent line to the graph of $y = 2x + \ln\left(\frac{1}{x}\right)$ at $x = 1$.

179) _____

A) $y - 2 = \left(2 - \frac{1}{x}\right)(x - 1)$

B) $y = x + 1$

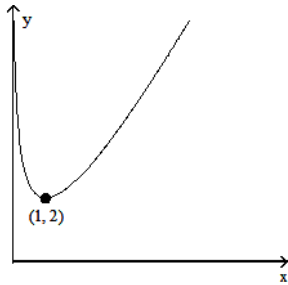
C) $y - 1 = \left(2 - \frac{1}{x}\right)(x - 1)$

D) $y = 2(x - 1) + 1$

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

180) Is this the graph of $y = 2x - \ln x^2$, $x > 0$? Enter just the word "yes" or "no".

180) _____



MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Find the x-value of all points where the function has relative extrema. Find the value(s) of any relative extrema.

181) $f(x) = \frac{x^3}{8 \ln x}$ 181) _____

- A) Relative minimum of $-\frac{3}{8}e^{-1}$ at $e^{-1/3}$
- B) Relative minimum of $\frac{3}{8}e$ at $e^{1/3}$
- C) Relative maximum of 0 at 0; relative minimum of $\frac{3}{8}e$ at $e^{1/3}$
- D) Relative minimum of 0 at 0

Solve the problem.

182) Assume the total revenue from the sale of x items is given by $R(x) = 21 \ln(2x + 1)$, while the total cost to produce x items is $C(x) = x/4$. Find the approximate number of items that should be manufactured so that profit, $R(x) - C(x)$, is maximum. 182) _____

- A) 11 items
- B) 46 items
- C) 65 items
- D) 84 items

183) Suppose that the population of a certain type of insect in a region near the equator is given by $P(t) = 19 \ln(t + 11)$, where t represents the time in days. Find the rate of change of the population when $t = 4$. 183) _____

- A) 1.3 insects
- B) 2.6 insects
- C) 4.8 insects
- D) 1.7 insects

184) Suppose that the demand function for x units of a certain item is $p = 100 + \frac{210 \ln(x+5)}{x}$, where p is the price per unit, in dollars. Find the marginal revenue. 184) _____

A) $\frac{dR}{dx} = \frac{210 [x - (x+5) \ln(x+5)]}{x^2(x+5)}$

B) $\frac{dR}{dx} = \frac{210[x - [\ln(x+5)]^2]}{x^2 \ln(x+5)}$

C) $\frac{dR}{dx} = 100 + \frac{210}{x+5}$

D) $\frac{dR}{dx} = 100 + \frac{210}{\ln(x+5)}$

185) Students in a math class took a final exam. They took equivalent forms of the exam in monthly intervals thereafter. The average score $S(t)$, in percent, after t months was found to be given by $S(t) = 70 - 20 \ln(t+1)$, $t \geq 0$. 185) _____

Find $S'(t)$.

A) $S'(t) = 70 - \frac{20}{t+1}$

B) $S'(t) = \frac{20}{t+1}$

C) $S'(t) = -\frac{20}{t+1}$

D) $S'(t) = -20 \ln\left(\frac{1}{t+1}\right)$

Simplify.

186) $\ln \frac{x^5 y^{-4}}{w^3 z^{-2}}$ 186) _____

A) $5 \ln x - 4 \ln y - 3 \ln w + 2 \ln z$

B) $5 \ln x + 4 \ln y - 3 \ln w - 2 \ln z$

C) $5 \ln x - 4 \ln y - 3 \ln w - 2 \ln z$

D) $5 \ln x + 4 \ln y - 3 \ln w + 2 \ln z$

E) none of these

187) $\ln \frac{x^4 - 5}{z^3 y^4}$ 187) _____

A) $\ln(x^4 - 5) - 3 \ln z + 4 \ln y$

B) $\ln(x^4 - 5) - 3 \ln z - 4 \ln y$

C) $\ln(x^4 - 5) + 3 \ln z + 4 \ln y$

D) $4 \ln x - \ln 5 - 3 \ln z - 4 \ln y$

E) $4 \ln x - \ln 5 - 3 \ln z + 4 \ln y$

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

188) $\ln(x+2) + \ln(x-2)$. 188) _____
Enter your answer as just $\ln(P(x))$ where P is a polynomial in x in standard form.

$$189) \ln xyz - \ln \left(\frac{y^2}{x} \right)$$

189) _____

Enter your answer as just $\ln \frac{a^nb}{c}$.

$$190) \frac{1}{3} \ln 27 - 2 \ln 4 + \ln 3 + (\ln 2)^2 - e^{\ln 6} + \frac{1}{4} \ln 81$$

190) _____

Enter your answer exactly as just $(\ln a)^n + \ln \left(\frac{b}{c} \right) - d$.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

$$191) \ln 8 - \ln 4$$

191) _____

A) $\ln(2)$

B) $\ln(2)$

C) $\ln \left(\frac{1}{2} \right)$

D) $\ln(4)$

$$192) \frac{1}{2} \ln x - \ln 5$$

192) _____

A) $\ln \left(\frac{x}{2} - 5 \right)$

B) $\ln \left(\frac{\sqrt{x}}{5} \right)$

C) $\ln(\sqrt{x} - 5)$

D) $\ln \left(\sqrt{\frac{x}{5}} \right)$

$$193) \ln x - 3[2 \ln(x - 6) - \ln(x + 6)]$$

193) _____

A) $\ln \frac{x(x + 6)^2}{(x - 6)^3}$

B) $\ln \frac{x(x - 6)^3}{(x + 6)^2}$

C) $\ln \frac{x(x + 6)^2}{(x - 6)^2}$

D) $\ln \frac{x(x + 6)^3}{(x - 6)^6}$

$$194) \text{ Which of the following is the largest number?}$$

194) _____

A) $\frac{1}{2} \ln 16$

B) $\frac{1}{3} \ln 27$

C) $\ln 6 - \ln 1$

D) $\frac{3}{2} \ln 16 - \ln 8$

E) $2 \ln 2 + \ln 3$

Given $\ln 2 = 0.6931$ and $\ln 5 = 1.6094$, find the following.

$$195) \ln 20$$

195) _____

A) 2.23095028

B) 3.9119

C) 2.3025

D) 2.9956

$$196) \ln \frac{5}{4}$$

196) _____

A) 1.16101573

B) 0.2232

C) 2.9956

D) -0.2232

197) $\ln 50$

A) 1.1155

B) 2.231

C) 3.9119

D) 2.9956

197) _____

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Solve for x.

198) $e^{1+x} - 2 = 4$

Enter your answer exactly as just $a \pm \ln b$ (a, b integers).

198) _____

199) $\ln(1 + x^2) = 2$.

Enter your answer exactly as just $\pm\sqrt{e^a \pm b}$ (a, b integers).

199) _____

200) $e^{1+x} = 2e^{2x}$.

Enter your answer exactly as just $a \pm \ln b$ (a, b integers).

200) _____

201) $2 \ln x + 3 \ln x = 4$

Enter your answer exactly as just $e^{a/b}$ (a, b integers).

201) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

202) $\ln(4x - 3) - \ln 3 + \ln(x - 1) = 0$

A) $1, \frac{1}{4}$

B) $\frac{7}{4}$

C) $0, \frac{7}{4}$

D) \emptyset

202) _____

203) $\ln x - \ln(x - 9) - \ln 6 = 0$

A) $\frac{9 \ln 6}{\ln 6 - 1}$

B) $\frac{54}{5}$

C) -3

D) \emptyset

203) _____

204) $\ln x + \ln x^8 = 9$

A) $\frac{e^8}{9}$

B) e^9

C) $e^{9/8}$

D) e

204) _____

Provide an appropriate response.

205) Determine the values of h and k for which the graph of $y = he^{kx}$ passes through the points (1, 4) and (4, 256).

A) $h = \ln 1$; $k = \ln 4$

B) $h = 1$; $k = \ln 5$

C) $h = 1$; $k = \ln 4$

D) $h = 2$; $k = 4$

205) _____

206) A study comparing the sizes of two populations, x and y , shows that they can be related by the equation $\ln(1 + y) - k \ln x = \ln C$, where k and C are constants. Solve the equation for y when $k = 3$ and $C = 15$.

206) _____

A) $y = 15x^{-3} + 1$

B) $y = 15e^{3x} - 1$

C) $y = 15x^3 - 1$

D) $y = e^{3x + 15} - 1$

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Differentiate.

207) $\ln \left[\frac{\sqrt{x}e^x}{x^2 + 1} \right]$ at $x = 1$

207) _____

Enter just a reduced fraction of form $\frac{a}{b}$.

208) $\ln \left(\frac{t+e}{t-e} \right)$

208) _____

Enter your answer as just $\frac{ae}{t^n \pm e^m}$.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

209) $f(x) = \ln \left(\frac{x^4 + 2}{x} \right)$

209) _____

A) $\frac{x}{x^4 + 2}$

B) $\frac{4x^3 - 1}{x(x^4 + 2)}$

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

D) $\frac{4x^3}{x^4 + 2}$

210) $f(t) = \ln [(t^3 - 2)(t^4 + 6)]$

210) _____

A) $\frac{1}{(t^3 - 2)(t^4 + 6)}$

B) $\ln[3t^2(t^4 + 6) + 4t^3(t^3 - 2)]$

C) $\frac{12t^5}{(t^3 - 2)(t^4 + 6)}$

D) $\frac{3t^2(t^4 + 6) + 4t^3(t^3 - 2)}{(t^3 - 2)(t^4 + 6)}$

211) $y = \ln \frac{1-x}{(x+4)^6}$

211) _____

A) $\frac{5x-10}{(x+4)^7}$

B) $\frac{(x+4)^6}{1-x}$

C) $\ln \frac{7x-10}{(x+4)^7}$

D) $\frac{5x-10}{(x+4)(1-x)}$

212) $y = \ln \sqrt{1+x^2}$

212) _____

A) $\frac{1}{\sqrt{1+x^2}}$

B) $\frac{x}{x^2+1}$

C) $\ln \frac{x}{\sqrt{x^2+1}}$

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

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Use logarithmic differentiation to differentiate.

213) $(3x + 1)^5(2x - 1)^{-2}(x + 3)^4$ at $x = 1$ 213) _____
 Enter your answer exactly as just $3 \cdot 4^a$.

214) 3^x 214) _____
 Enter your answer as just $a^b \ln c$.

215) $4^x \cdot 5^x \cdot 6x^3$ at $x = 1$ 215) _____
 Enter your answer exactly as just $a(b \pm \ln c)$ where a , b , and c are integers.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Use logarithmic differentiation to find dy/dx .

216) $y = 8^{3x}$ 216) _____
 A) $8 (\ln 3) 8^{3x}$ B) $24 (\ln 8) 8^{3x}$ C) $24 (\ln 3) 8^{3x}$ D) $3 (\ln 8) 8^{3x}$

217) $y = 23^{-x}$ 217) _____
 A) -23^{-x} B) $-\ln 23 (23^{-x})$ C) $\ln 23 (23^{-x})$ D) 23^{-x}

Answer Key

Testname: UNTITLED4

- 1) $2^{5x/2}$
- 2) 2^{4x}
- 3) 2^{5x}
- 4) 2^x
- 5) $2^{-x^2} - x$
- 6) $2^{-52x} \cdot 3^{-9x}$
- 7) 3^{11x}
- 8) 3^{23x}
- 9) 3^{-138x}
- 10) 3^{-3x^2}
- 11) $2^x \cdot 7^{16x}$
- 12) 210^x
- 13) y^{11x+4}
- 14) C
- 15) A
- 16) A
- 17) A
- 18) A
- 19) A
- 20) A
- 21) A
- 22) C
- 23) D
- 24) $x = \frac{1}{3}$
- 25) $x = -3, 1$
- 26) $x = -\frac{1}{4}$
- 27) $x = -6$
- 28) $x = -3, -2$
- 29) B
- 30) B
- 31) D
- 32) A
- 33) C
- 34) A
- 35) B
- 36) 5^h
- 37) 2^{2x+1}
- 38) D
- 39) 0
- 40) 0

Answer Key

Testname: UNTITLED4

41) $y = \frac{1}{4}x + \frac{1}{2}$

42) $y = 2ex - e$

43) $y = e$

44) B

45) A

46) E

47) C

48) A

49) A

50) e^{5x}

51) $e^{2x} - e^{-2x}$

52) $e^{2x} + e^{-2x}$

53) $e^{(-19/8)x + 5}$

54) B

55) D

56) C

57) B

58) $(x^2 + 2x + 1)e^x$

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

60) D

61) A

62) C

63) B

64) B

65) D

66) B

67) D

68) C

69) A

70) C

71) A

72) D

73) D

74) D

75) C

76) A

77) B

78) D

79) A

80) B

Answer Key

Testname: UNTITLED4

- 81) B
- 82) D
- 83) D
- 84) C
- 85) $2e^{2x} - 2x$
- 86) $e^{-4x}(-4x^3 + 3x^2 - 4)$
- 87) $6e^{3e^{2x} + 2x}$
- 88) $12e^{3x}$
- 89) $\frac{-2e^x}{(e^x - 1)^2}$
- 90) $4e^{4x} + 2e^{2x} + e^x$
- 91) $e^{-x^3}(-3x^5 + 3x^2)$
- 92) $-x^{-2}e^{x^{-1}}$
- 93) $e^{-x}(-x + 1)$
- 94) E
- 95) B
- 96) A
- 97) A
- 98) B
- 99) C
- 100) C
- 101) A
- 102) D
- 103) $6x$
- 104) $\frac{5}{2}x$
- 105) $2x$
- 106) x^2e^x
- 107) xy^{-2}
- 108) $-x$
- 109) x^2
- 110) x^{-1}
- 111) C
- 112) A
- 113) C
- 114) B
- 115) C
- 116) C
- 117) B
- 118) D
- 119) D

Answer Key

Testname: UNTITLED4

120) A

121) C

122) B

123) D

124) B

125) $x = \frac{1 - \ln 2}{3}$

126) $x = e^{-2}, 1$

127) $x = \frac{5}{3}$

128) $x = \frac{\ln 5 - 2}{3}$

129) $-1 + \ln 2$

130) $1 + \ln 2$

131) $\frac{1}{e^4 - 1}$

132) 0

133) A

134) B

135) A

136) A

137) A

138) A

139) B

140) B

141) D

142) D

143) C

144) A

145) C

146) A

147) D

148) B

149) C

150) B

151) B

152) D

153) B

154) A

155) C

156) C

157) B

158) C

Answer Key

Testname: UNTITLED4

159) A

160) B

161) $\frac{4x}{2x^2 + 1}$

162) $\frac{1 - 3 \ln x}{x^4}$

163) $\frac{2x^5}{x^2 + 1} + 4x^3 \ln(x^2 + 1)$

164) $e^x \ln 2x + \frac{e^x}{x}$

165) $e^{(\ln x)^2} \frac{2 \ln x}{x}$

166) $\frac{5(\ln x)^4}{x}$

167) $\frac{4(\ln x)^3}{x}$

168) 16

169) $\frac{-\ln 3}{x(\ln x)^2}$

170) e^{-1}

171) 0

172) $\frac{4x^3 - 3x^2 + 2}{x^4 - x^3 + 2x + 1}$

173) $e(1 + \ln 4)$

174) $\frac{5}{7}$

175) $-\frac{1}{2}$

176) 0

177) D

178) D

179) B

180) yes

181) B

182) D

183) A

184) C

185) C

186) A

187) B

188) $\ln(x^2 - 4)$

Answer Key

Testname: UNTITLED4

189) $\ln \frac{x^2 z}{y}$

190) $(\ln 2)^2 + \ln \left(\frac{9}{16} \right) - 18$

191) A

192) B

193) D

194) E

195) D

196) B

197) C

198) $-1 + \ln 6$

199) $\pm \sqrt{e^2 - 1}$

200) $1 - \ln 2$

201) $e^{4/5}$

202) B

203) B

204) D

205) C

206) C

207) $\frac{1}{2}$

208) $\frac{-2e}{t^2 - e^2}$

209) C

210) D

211) D

212) B

213) $3 \cdot 4^8$

214) $3^x \ln 3$

215) $120(3 + \ln 20)$

216) D

217) B