1 Evaluate the expression

\[ \log_{10} 1000 \]

2 Use the properties of logarithms to solve the equation for \( x \).

\[ \ln(3x - 1) - \ln(x - 1) = \ln 8 \]

a. \( x = 0 \)  
   b. \( x = -\frac{7}{5} \)  
   c. \( x = \frac{5}{7} \)  
   d. \( x = \frac{1}{5} \)  
   e. \( x = \frac{7}{5} \)

3 Solve the equation for \( x \).

\[ \log_2 (9 + x) = 5 \]

4 Sketch the graph of the function.

\[ g(x) = \log_3 (x - 1) + 4 \]

Select the correct graph.

- A
- B
- C
- D

5 Determine the values of \( x \) that satisfy the expression

\[ \ln \left( x^2 + 3 \right) = \ln (x - 2) + \ln (x + 3) \]
6 Use the properties of logarithms to simplify the expression so that the result does not contain logarithms of products, quotients, or powers. Assume that all necessary conditions are satisfied.

\[ \log_2 (8x - 1)^6 \]

7 Determine all values of \( x \) that satisfy the following equation.

\[ x^2 4^{x/2} - x 2^x + 1 - 3 \cdot 2^x = 0 \]

8 Rewrite the expression as a single logarithm.

\[ \ln (x - 1) + \frac{1}{2} \ln x - 5 \ln x \]

9 Rewrite the expression as a single logarithm.

\[ \ln x + 2 \ln (x + 5) \]
10 Sketch the graph, showing any horizontal asymptotes.

\[ f(x) = e^{x - 2} + 3 \]

a. 

b. 

d. 

e. 

c. 

11 Determine the domain of \( f(x) = \sqrt{\frac{2x + 3x}{e^{x} - xe - 2e}} \).
12 Use the properties of logarithms to simplify the expression so that the result does not contain logarithms of products, quotients, or powers. Assume that all necessary conditions are satisfied.

\[
\ln \frac{x^4 \sqrt{x - 1}}{\sqrt[3]{x^2 + 8x + 16}}
\]

a. \(4 \ln x - \frac{1}{2} \ln(x - 1) + \frac{2}{3} \ln(x - 4)\)

b. \(4 \ln x + \frac{1}{2} \ln(x - 1) - \frac{2}{3} \ln(x + 8)\)

c. \(\frac{1}{2} \ln(x - 1) - \frac{2}{3} \ln(x + 4)\)

d. \(4 \ln x + \frac{1}{2} \ln(x - 1) - \frac{2}{3} \ln(x + 4)\)

e. \(5 \ln x + \frac{1}{2} \ln(x - 1) - \frac{2}{3} \ln(x + 4)\)

13 Sketch the graph of \(f(x) = 4 - e^{x - 3}\).

Select the correct graph.

14 Evaluate the expression.

\[\ln e^{1/2}\]

a. 2  

b. \(e\)

c. \(\frac{1}{2}\)  

d. \(e^{1/2}\)

e. \(e^2\)
15 Evaluate the expression.

\[ \log_{625} 5 \]

16 Determine all values of \( x \) that satisfy the following equation.

\[ 2^{2x - 3} = 8 \]

17 Determine all values of \( x \) that satisfy the following equation.

\[ 3^x - 5 = 9^x + 2 \]

18 Find the domain of the function

\[ f(x) = \ln \left( \frac{x^2 - 4}{x - 5} \right) \]

19 Use the inverse relationship with the exponential functions to determine \( x \)

\[ x = \log_4 64 \]

20 Use the properties of logarithms to simplify the expression so that the result does not contain logarithms of products, quotients, or powers.

\[ \ln x (x + 6) \]
ANSWER KEY

Exponentials and Logarithms

1. 3  
2. e  
3. 23  
4. D  
5. 9  
6. \(6 \log_2 (8x-1)\)  
7. -1,3  
8. \(\ln \frac{x-1}{\sqrt[5]{x}}\)  
9. \(\ln x(x+5)^2\)  
10. b  
11. \((-\infty, 1) \cup [2, \infty)\)  
12. d  
13. B  
14. c  
15. \(\frac{1}{4}\)  
16. 3  
17. -9  
18. \((-2,2) \cup (5, \infty)\)  
19. 3  
20. \(\ln(x) + \ln(x+6)\)