Practice Set 9.1
Exponential Functions

Set up a table of values for each function. Use the table of coordinates to graph each function.

1. \( f(x) = 2^{x-1} \)
   
   1. ________________

2. \( f(x) = -2^x \)
   
   2. ________________

3. \( f(x) = 2^x - 1 \)
   
   3. ________________
4. \( f(x) = 4^x \)

5. \( f(x) = \left(\frac{1}{4}\right)^x \)

6. \( f(x) = 4^{-x} \)

7. \( f(x) = 4^x - 2 \)
Use the compound interest formula, $A = P\left(1 + \frac{r}{n}\right)^{nt}$ or $A = Pe^{rt}$ to solve exercises 8-10.

8. Jerry’s grandmother gave him $100 for his birthday. If he puts his money in a savings account that earns 5% interest compounded quarterly, how much money will he have after 3 years?

9. A man invests $7500 at 12% interest for two years. How much money will he have if the interest is compounded continuously?

10. A certificate of deposit (CD) earns 12.5% interest compounded monthly. If a woman invested $1500 into a CD, how much money will she have at the end of 1 year?
Practice Set 9.2
Composite and Inverse Functions

Answer Yes or No. Are the given functions inverses?

1. \( f(x) = \frac{1}{2}x - 4 \) and \( g(x) = 2x + 8 \)
   1. _______________

2. \( f(x) = 2x + 5 \) and \( g(x) = \frac{1}{2}x - 10 \)
   2. _______________

3. \( f(x) = 6x \) and \( g(x) = -6x \)
   3. _______________

4. \( f(x) = x^2 + 2 \) and \( g(x) = \frac{1}{2}x + 1 \)
   4. _______________

5. \( f(x) = 3x - 7 \) and \( g(x) = \frac{x + 7}{3} \)
   5. _______________

For each pair of functions find (a.) \( (f \circ g)(x) \) and (b.) \( (g \circ f)(x) \).

6. \( f(x) = 2x + 3 \) and \( g(x) = x^2 \)
   6a. _______________
   b. _______________

7. \( f(x) = x + 4 \) and \( g(x) = x - 6 \)
   7a. _______________
   b. _______________
Find the equation for the inverse function $f^{-1}(x)$ for each given function

8. $f(x) = x^2 + 1$ and $g(x) = 2x - 3$

8a. 

b. 

9. $f(x) = x - 2$ and $g(x) = x^2 + 2$

9a. 

b. 

10. $f(x) = 8x$

10. 

11. $f(x) = 6x - 7$

11. 

12. $f(x) = 3x + 5$

12. 

13. $f(x) = x^2 + 4$

13. 

14. $f(x) = \frac{5}{x}$

14. 

110
Practice Set 9.3
Logarithmic Functions

Complete the table to form equivalent equations.

<table>
<thead>
<tr>
<th></th>
<th>Logarithmic Form</th>
<th>Exponential Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td>$5^3 = 125$</td>
</tr>
<tr>
<td>2.</td>
<td>$\log_5 32 = 5$</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td>$3^4 = 81$</td>
</tr>
<tr>
<td>4.</td>
<td>$\log_6 216 = 3$</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>$\log_4 1024 = 5$</td>
<td>$16^{\frac{1}{4}} = \frac{1}{2}$</td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td>$3^{-2} = \frac{1}{9}$</td>
</tr>
<tr>
<td>7.</td>
<td>$\log_b 36 = 2$</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td></td>
<td>$7^2 = 49$</td>
</tr>
<tr>
<td>9.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>$2 = \log_3 81$</td>
<td></td>
</tr>
</tbody>
</table>

Evaluate each expression without using a calculator.

11. $\log_3 3 = \underline{1}$
12. $\log_2 1 = \underline{0}$
13. $\ln e = \underline{1}$
14. $5 \log_5 10 = \underline{1}$
15. $\ln e^8 = \underline{8}$
16. $\log 10 = \underline{1}$
17. $\log_2 \frac{1}{4} = \underline{-2}$
18. $\log_3 \frac{1}{9} = \underline{-2}$
19. $e^{\ln 49} = \underline{49}$
20. $\log 1 = \underline{0}$
21. $\log_2 64 = \underline{6}$
22. $10^{\log 17} = \underline{17}$
23. $\ln \frac{1}{e^4} = \underline{-4}$
24. $\log_8 8^6 = \underline{6}$
Practice Set 9.4
Properties of Logarithms

Use the properties of logarithms to expand each expression.

1. \( \log_4 3x \)
2. \( \log_5 \left( \frac{7}{x} \right) \)
3. \( \log_8 x^2 y^2 \)
4. \( \log_6 \left( \frac{5}{4y} \right) \)
5. \( \log_3 5xy \)
6. \( \log_7 \sqrt{x} \)
7. \( \log_2 \left( \frac{x^2 y}{7} \right) \)
8. \( \log_b \left( \frac{\sqrt[3]{x^3 y^2}}{2^5} \right) \)
9. \( \log_4 \sqrt[3]{y} \)
10. \( \log_5 \left( \frac{x}{\sqrt[3]{y}} \right) \)
Use the properties of logarithms to condense each logarithmic expression.

11. \( \log_2 9 + \log_2 x \)

12. \( \log_4 x - \log_4 y \)

13. \( \frac{1}{2} \log_3 x + 5 \log_3 y \)

14. \( 3 \log_b x - \log_b y - 5 \log_b z \)

15. \( 2 \log_3 x - \frac{1}{2} \log_3 y \)

16. \( \log_2 8 + 2 \log x - \log_2 y \)

17. \( \log_4 x - \log_4 5 \)

18. \( \log(6x + 2) - \log 3 - \log x \)

19. \( 5 \ln x - \frac{1}{2} \ln y \)

20. \( \frac{1}{3} \ln(x - 5) - \ln x \)
Practice Set 9.5
Exponential and Logarithmic Functions

Solve each exponential equation by expressing each side as a power of the same base and then equating exponents.

1. \(3^x = 81\)  
2. \(2^{2x-1} = 16\)  
3. \(4^{x+2} = \frac{1}{64}\)  
4. \(5^{x-4} = 125\)  
5. \(6^{x+1} = 216\)

Solve each exponential equation by taking the natural logarithm on both sides. Express the solution set in terms of natural logarithms. Then use a calculator to obtain a decimal approximation correct to two decimal places.

6. \(10^x = 1.47\)  
7. \(e^x = 4.9\)  
8. \(3^x = 14\)  
9. \(10^x = 3.67\)  
10. \(4e^x = 24\)

Solve each logarithmic equation. Be sure to reject any value of \(x\) that produces the logarithm of a negative number or the logarithm of zero in the original equation.

11. \(\log_4 x = 3\)  
12. \(\log_5 (x - 4) + \log_5 (x + 4) = 2\)  
13. \(\log x - \log 4 = \log 8\)  
14. \(\log x + \log(x + 5) = 2\log(x + 2)\)
Name:_________________________ Date:_______
Use the model for exponential growth or decay \( A = A_o e^{kt} \) to answer the problems. Round answers to the nearest dollar amount.

1. A pair of jeans costs $35 today. What will the jeans cost in 10 years if the rate of increase is 8%?

2. A mid-size automobile costs $18,000. If the growth rate is 10%, what will the cost of the automobile be in 5 years?

3. An airplane ticket from Dallas to Nashville costs $300 in 2007. If ticket prices continue to increase at the current rate, the cost of the same ticket will be $996 in 2017. What is the rate of increase per year?

4. A pair of volleyball shoes costs $80 in 2008. If the price of the same type volleyball shoe is $135 in 2016, what is the rate of increase in price?

5. A new lawnmower costs $325 in 1998. By 2008 the cost of the same kind of lawnmower was $536. What was the rate of the price increase?

6. A newlywed couple purchased a small home in 2000 for $65,000. If they were able to sell the home for $125,762 in 2006, what was the price increase rate?
For problems 7-10, use your graphing utility to create a scatter plot for the ordered pairs in each table. Use the scatter plot to determine the type of function that is the best choice for modeling the data: exponential, logarithmic, linear, or quadratic.

7. | $x$ | $y$ |
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>$-2$</td>
<td>6</td>
</tr>
<tr>
<td>$-1$</td>
<td>3</td>
</tr>
<tr>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
</tr>
</tbody>
</table>

8. | $x$ | $y$ |
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>16.4</td>
</tr>
<tr>
<td>30</td>
<td>37.2</td>
</tr>
<tr>
<td>60</td>
<td>32.1</td>
</tr>
<tr>
<td>90</td>
<td>29.4</td>
</tr>
<tr>
<td>120</td>
<td>27.9</td>
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<tr>
<td>150</td>
<td>27</td>
</tr>
<tr>
<td>180</td>
<td>26.6</td>
</tr>
</tbody>
</table>

9. | $x$ | $y$ |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$-2$</td>
<td>$-7$</td>
</tr>
<tr>
<td>$-1$</td>
<td>$-4$</td>
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<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>

10. | $x$ | $y$ |
    |---|---|
    | 0   | 76 |
    | 30   | 49.2 |
    | 60   | 43.9 |
    | 90   | 40.7 |
    | 120  | 38.5 |