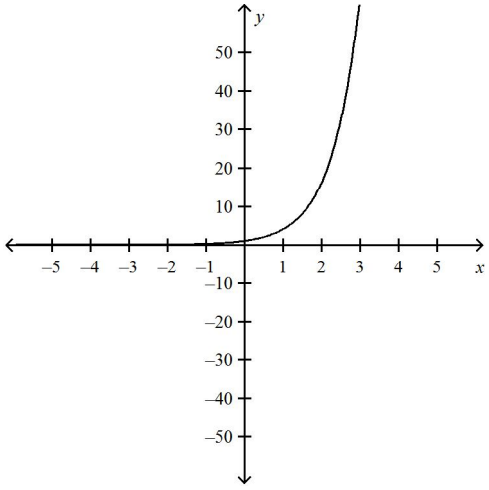
Name: _____

Advanced Functions: Chapter 7: Practice Problems - Exponential and Logarithmic Functions

Here are some practice problems! Some of these are easy, some aren't. Ask for help, read your notes and your textbook, use your mind.

1. State the domain and range of the transformed function $f(x)=6\log_{10}(-2(x-5))$.
2. Use the graph of $f(x)=4^x$ to estimate the value of $\log_4 27$. Demonstrate you thinking by drawing appropriate lines on the graph.



3. Evaluate $\log_5 625+\log_2 32$.
4. Evaluate $\log_4 \sqrt[5]{64}$.
5. State the laws of logarithms you would use to rewrite $\log(\sqrt[4]{5x})$ as $\frac{1}{4}(\log 5+\log x)$.
6. Simplify $\log_2 160-\log_2 5$.
7. Write $1+\log_2 x^3$ as a single logarithm.
8. If $\log_b x=0.8$, find the value of $\log_b(b\cdot\sqrt[4]{x})$.
9. Use the laws of logarithms to express $\log_b(\sqrt{x^3yz^6})$ in terms of $\log_b x$, $\log_b y$, and $\log_b z$.
10. Solve $\log_2 x-\log_2 6=\log_2 5+2\log_2 3$ for x.
11. If you invested money into an account that pays 9%/a compounded weekly, how many years would it take for your deposit to double?
12. Determine the points of intersection for the graphs of $y=2(3^x)$ and $y=6(2^x)$. Round your answer to one decimal place.

13. Solve $10^{x+2} - 10^x = 9900$ for x.

14. A bacteria culture doubles every 20 minutes. How many hours will it take a culture of 60 bacteria to grow to a population of 8400?

15. Solve $\log_8(\log_5 x) = 0$.

16. Solve $x = \log_3 75.8$ for x. Round your answer to two decimal places.

17. Solve $\log(x+3) + \log(x-2) = \log(3x+2)$.

18. What are the restrictions on the variable in the equation $\log(3x-5) - \log(x-2) = \log(x^2-5)$? Solve the equation (note - remember how much you loved using the Factor Theorem? You're welcome!)

19. What is the pH of a solution with a hydrogen ion concentration of 3.7×10^{-3} mol/L?

20. The population of a town is increasing at a rate of 6.2% per year. The city council believes they will have to add another elementary school when the population reaches 100 000. If there are currently 76 000 people living in the town, how long do they have before the new school will be needed?

21. How long will it take a $3000 investment to grow to $5000 if it is invested at 8.5%/a compounded annually?

22. The half-life of radium is 1620 years. If a laboratory has 12 grams of radium, how long will it take before it has 8 grams of radium left?

23. Write $\frac{1}{3}\log_a x + \frac{1}{2}\log_a 2y - \frac{1}{6}\log_a 4z$ as a single logarithm. Assume that all variables represent positive numbers.

24. Solve $5^{x-2} = 4^{2x+3}$ for x.

Advanced Functions: Chapter 7: Practice Problems - Exponential and Logarithmic Functions Answer Section

SHORT ANSWER

1. ANS:
Domain: $\{x \in \mathbf{R} \mid x < 5\}$
Range: $\{x \in \mathbf{R}\}$

PTS: 1 REF: Application OBJ: 8.2 - Transformations of Logarithmic Functions

2. ANS:
2.4

PTS: 1 REF: Communication OBJ: 8.3 - Evaluating Logarithms

3. ANS:
9

PTS: 1 REF: Knowledge and Understanding OBJ: 8.3 - Evaluating Logarithms

4. ANS:
$\frac{3}{5}$

PTS: 1 REF: Knowledge and Understanding OBJ: 8.3 - Evaluating Logarithms

5. ANS:
First the power law of logarithms, then the product law of logarithms.

PTS: 1 REF: Communication OBJ: 8.4 - Laws of Logarithms

6. ANS:
5

PTS: 1 REF: Knowledge and Understanding OBJ: 8.4 - Laws of Logarithms

7. ANS:
$\log_2 2x^3$

PTS: 1 REF: Thinking OBJ: 8.4 - Laws of Logarithms

8. ANS:
1.2

PTS: 1 REF: Application OBJ: 8.4 - Laws of Logarithms

9. ANS:
$\frac{3}{2}\log_b x + \frac{1}{2}\log_b y + 3\log_b z$

PTS: 1 REF: Knowledge and Understanding OBJ: 8.4 - Laws of Logarithms

10. ANS:
270

PTS: 1 REF: Application OBJ: 8.4 - Laws of Logarithms

11. ANS:
7.7 years

PTS: 1 REF: Application OBJ: 8.5 - Solving Exponential Equations

12. ANS:
(2.7, 39.2)

PTS: 1 REF: Thinking OBJ: 8.5 - Solving Exponential Equations

13. ANS:
2

PTS: 1 REF: Knowledge and Understanding OBJ: 8.5 - Solving Exponential Equations

14. ANS:
2.4 hours

PTS: 1 REF: Application OBJ: 8.5 - Solving Exponential Equations

15. ANS:
5

PTS: 1 REF: Thinking OBJ: 8.6 - Solving Logarithmic Equations

16. ANS:
3.94

PTS: 1 REF: Knowledge and Understanding OBJ: 8.5 - Solving Exponential Equations

17. ANS:
4

PTS: 1 REF: Thinking OBJ: 8.6 - Solving Logarithmic Equations

18. ANS:
$x \geq \sqrt{5}$

PTS: 1 REF: Knowledge and Understanding OBJ: 8.6 - Solving Logarithmic Equations

19. ANS:
2.43

PTS: 1 REF: Knowledge and Understanding
OBJ: 8.7 - Solving Problems with Exponential and Logarithmic Functions

20. ANS:
4.6 years

PTS: 1 REF: Application
OBJ: 8.7 - Solving Problems with Exponential and Logarithmic Functions

21. ANS:
6.3 years

PTS: 1 REF: Knowledge and Understanding
OBJ: 8.7 - Solving Problems with Exponential and Logarithmic Functions

PROBLEM

22. ANS:
The equation for relating the amount of radium, *r*, in grams and the amount of time, *t*, in years is $r = 12 \times \left(\frac{1}{2}\right)^{(t \div 1620)}$.

Substituting 8 in for *r* gives $8 = 12 \times (\frac{1}{2})^{(t \div 1620)}$

$\frac{2}{3} = \left(\frac{1}{2}\right)^{(t \div 1620)}$

Using guess and check gives $\frac{t}{1620} = 0.59$

t=956 years

PTS: 1 REF: Application OBJ: 8.3 - Evaluating Logarithms

23. ANS:
$\frac{1}{3}\log_a x + \frac{1}{2}\log_a 2y - \frac{1}{6}\log_a 4z$
$= \log_a \sqrt[3]{x} + \log_a \sqrt{2y} - \log_a \sqrt[6]{4z}$
$= \log_a \frac{\sqrt[3]{x}\sqrt{2y}}{\sqrt[6]{4z}}$

PTS: 1 REF: Knowledge and Understanding OBJ: 8.4 - Laws of Logarithms

24. ANS:
$5^{x-2} = 4^{2x+3}$
$\log 5^{x-2} = \log 4^{2x+3}$
$(x-2)\log 5 = (2x+3)\log 4$
$x\log 5 - 2\log 5 = 2x\log 4 + 3\log 4$
$x\log 5 - 2x\log 4 = 2\log 5 + 3\log 4$
$x(\log 5 - 2\log 4) = 2\log 5 + 3\log 4$
$x = \frac{2\log 5 + 3\log 4}{\log 5 - 2\log 4}$
$x = -6.34$

PTS: 1 REF: Knowledge and Understanding OBJ: 8.5 - Solving Exponential Equations