

# Algebra II Review

## Exponential Functions and Logarithms – Answer Key

\*\*\* Although there is not a specific SPI for this activity, there are two checks for understanding that will require students to understand these basic problems involving logarithms.

- ✓ 3103.3.13 Solve problems using exponential functions requiring the use of logarithms for their solutions.
- ✓ 3103.3.16 Prove basic properties of logarithms using properties of exponents and apply those properties to solve problems.

1. Identify each function as linear, quadratic, or exponential.

A.  $y = 5(0.3)^x + 2$   
**exponential**

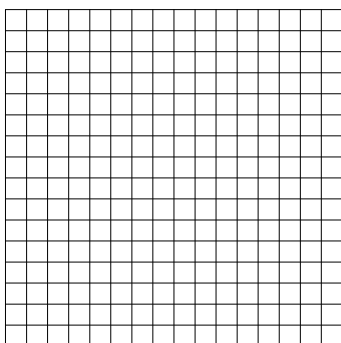
B.  $y = 7x^2$   
**quadratic**

C.  $y = 5x - 11$   
**linear**

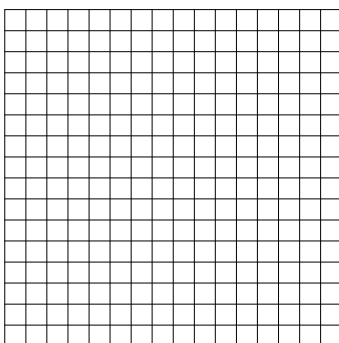
D.  $y = (3)(4)^x$   
**exponential**

2. Sketch the graph of each function. Then state the function's domain and range.

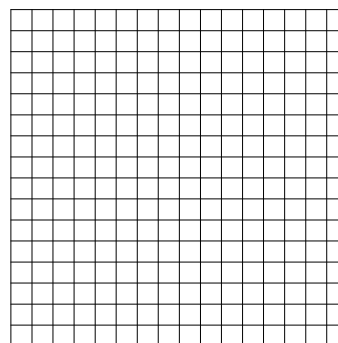
A.  $y = 4^x$



B.  $y = 2(\frac{1}{2})^x$



C.  $y = 1.5(2)^x$



**For all 3 graphs, the domain is all real numbers, and the range is all positive numbers.**

3. Determine whether each function represents exponential growth or decay.

A.  $y = 7(0.3)^x$   
**Decay**

B.  $y = 0.2(4)^x$   
**growth**

C.  $y = 7(10)^{-x}$   
**decay**

4. Write an exponential function whose graph passes through the given points.

A. (0, 3) and (-1, 6)

**$y = 3(\frac{1}{2})^x$**

B. (0, 7) and (2, 63)

**$y = 7(3)^x$**

C.  $(0, -\frac{2}{5})$  and  $(2, -10)$

**$y = -\frac{2}{5}(5)^x$**

5. Simplify each expression.

A.  $(5^{\sqrt{2}})^{\sqrt{2}}$

**25**

B.  $(x^{\sqrt{3}})^{\sqrt{2}}$

**$x^{\sqrt{6}}$**

C.  $5^{2\sqrt{7}} \cdot 5^{3\sqrt{7}}$

**$5^{5\sqrt{7}}$**

D.  $y^{5\sqrt{3}} \div y^{2\sqrt{3}}$

**$y^{3\sqrt{3}}$**

E.  $x^{8\pi} \div x^{3\pi}$

**$x^{5\pi}$**

F.  $64^\pi \cdot 2^\pi$

**$2^{7\pi}$**

6. Solve each equation. Check your solution.

A.  $3^{2x-1} = 3^{x+2}$

$x = 3$

B.  $2^{4x} = 4^8$

$x = 4$

C.  $25^{2x} = 125^{x+2}$

$x = 6$

D.  $\left(\frac{1}{25}\right)^n = 125^{n+7}$

$n = -\frac{21}{5}$

E.  $16^{4n-1} = 128^{2n+1}$

$n = \frac{11}{2}$

F.  $121^x = 11^{x^2-15}$

$n = -3, n = 5$

7. Write each equation in logarithmic form.

A.  $3^5 = 243$

$\log_3 243 = 5$

B.  $2^{-2} = \frac{1}{8}$

$\log_2 \frac{1}{8} = -2$

C.  $7776^{\frac{1}{5}} = 6$

$7776^6 = \frac{1}{5}$

8. Write each equation in exponential form.

A.  $\log_{12} 144 = 2$

$12^2 = 144$

B.  $\log_{16} 8 = \frac{3}{4}$

$16^{\frac{3}{4}} = 8$

C.  $\log_3 \frac{1}{27} = -3$

$3^{-3} = \frac{1}{27}$

9. Evaluate each expression.

A.  $\log_5 625$

$4$

B.  $\log_3 \frac{1}{729}$

$-6$

C.  $\log_{10} 1,000$

$3$

D.  $\log_8 1$

$0$

E.  $\log_{81} 9$

$\frac{1}{2}$

F.  $\log_7 7^{(3n+2)}$

$3n + 2$

10. Solve each equation. Check your solutions.

A.  $\log_3 x = -2$

$\frac{1}{9}$

B.  $\log_2 x = 7$

128

C.  $\log_{36} x = \frac{3}{2}$

216

D.  $\log_2 (3x + 1) = 4$

5

E.  $\log_b 32 = 5$

2

F.  $\log_5 (3c - 5) = \log_5 (2c + 3)$

8

11. Use  $\log_3 2 \approx 0.6310$ ,  $\log_3 5 \approx 1.4560$ , and  $\log_3 7 \approx 1.7712$  to approximate the value of each expression.

A.  $\log_3 50$

3.5430

B.  $\log_3 70$

3.8582

C.  $\log_3 2.8$

.9462

12. Solve each equation. Check your solutions.

A.  $\log_7 x + \log_7 6 = \log_7 42$

$x = 7$

B.  $\log_3 x - \log_3 3 = \log_3 7$

$x = 21$

C.  $\frac{1}{2} \log_6 25 + \log_6 x = \log_6 20$

$x = 4$

D.  $\log_2 (x^2 - 4) - \log_2 (x + 2) = \log_2 1$

$x = 3$

E.  $2 \log_2 8 - \log_2 x^2 = 2$

$x = \pm 4$

F.  $\log_8 (n - 3) + \log_8 (n + 4) = 1$

$n = 4$

13. Use a calculator to evaluate each expression to four decimal places.

A.  $\log 23$

1.3617

B.  $\log 4.7$

0.6721

C.  $\log 0.002$

-2.6990

14. Solve each equation. Round to four decimal places.

A.  $7^x = 15$

$1.3917$

B.  $3^{5x} = 19$

$0.5360$

C.  $7^{x+3} = 56$

$-0.9314$

D.  $42^{x^2} = 84$

$\pm 1.0888$

E.  $5^{x^2-3} = 72$

$\pm 2.3785$

F.  $2^{n+1} = 5^{2n-1}$

$0.9117$

15. Express each logarithm in terms of common logarithms. Then approximate its value to four decimal places.

A.  $\log_5 113$

$2.9373$

B.  $\log_8 43$

$1.8088$

C.  $\log_2 25$

$4.6439$

16. Use a calculator to evaluate each expression to four decimal places.

A.  $\ln 8$

$2.0794$

B.  $e^3$

$20.0855$

C.  $\ln 0.023$

$-3.7723$

17. Write an equivalent exponential or logarithmic equation.

A.  $e^5 = 10x$

$5 = \ln 10x$

B.  $\ln x \approx 0.6931$

$x \approx e^{0.6931}$

C.  $e^{-5x} = 0.2$

$-5x = \ln 0.2$

18. Evaluate each expression.

A.  $\ln e^{7x}$

$7x$

B.  $e^{\ln 15}$

$15$

C.  $\ln e^{-3}$

$-3$

19. Solve each equation.

A.  $e^{4x} = 120$

$1.1969$

B.  $2e^{5x} = 24$

$0.4970$

C.  $1 - 2e^{2x} = -19$

$1.1513$

D.  $\ln 4x = 3$

$5.0214$

E.  $\ln(x - 2) = 2$

$9.3891$

F.  $\ln x + \ln 2x = 2$

$1.9221$