

Name: Guide Date: \_\_\_\_\_**Solving Exponential Functions**

Solve each equation:

1.  $3^{2x-5} = 3^{x+3}$

$$2x - 5 = x + 3$$

$$x - 5 = 3$$

$$\boxed{x = 8}$$

2.  $9^{x-5} = 27$

$$\boxed{x = 5}$$

3.  $5^{2x+3} = 625$

$$5^{2x+3} = 5^4$$

$$2x + 3 = 4$$

$$2x = 1$$

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

4.  $9^x = 27^{2x+8}$

$$3^{2x} = 3^{2(2x+8)}$$

$$2x = 4x + 16$$

$$-2x = 16$$

$$x = -8$$

5.  $3^{2x+3} = 27^{x+1}$

$$3^{2x+3} = (3^3)^{x+1}$$

$$2x + 3 = 3x + 3$$

$$3 = x + 3$$

$$\boxed{0 = x}$$

6.  $125^x = 25^{x+1}$

$$5^{3x} = 5^{2(x+1)}$$

$$3x = 2x + 2$$

$$x = 2$$

7.  $4^{3x} = 8^{x+1}$

$$(2^2)^{3x} = (2^3)^{x+1}$$

$$6x = 3x + 3$$

$$3x = 3$$

$$\boxed{x = 1}$$

8.  $4^x + 5 = 21$

$$4^x = 16$$

$$x = 2$$

9.  $3^{x-14} = \left(\frac{1}{3}\right)^{2x-1}$

$$3^{x-14} = (3^{-1})^{2x-1}$$

$$x - 14 = -2x + 1$$

$$3x - 14 = 1$$

$$3x = 15$$

$$\boxed{x = 5}$$

$$10. 81^{x+3} = \left(\frac{1}{3}\right)^{5x-6}$$

$$11. \left(\frac{1}{3}\right)^x - 9 = 18$$

$$\frac{+9 \quad +9}{\left(\frac{1}{3}\right)^x = 27}$$

$$(3^{-1})^x = 3^3$$

$$-1x = 3$$

$$\boxed{x = -3}$$

$$12. 4^x = \left(\frac{1}{2}\right)^{x-3}$$

Solve each inequality:

$$13. 4^{3x} < 2^{x+10}$$

$$(2^2)^{3x} < 2^{x+10}$$

$$6x < x+10$$

$$5x < 10$$

$$\boxed{x < 2}$$

$$14. 3^x \leq 27^{x-4}$$

$$15. 2^{7x-6} > 2^{5x+2}$$

$$7x-6 > 5x+2$$

$$2x-6 > 2$$

$$2x > 8$$

$$\boxed{x > 4}$$

17. There are 8 bacteria in a culture. The number of bacteria in the culture quadruples every hour. After how many hours will there be 2,048 bacteria?