

7.3 –Exp & Log Problem Solving

Name: _____

Write your questions and thoughts here!

PROPERTIES OF EQUALITY

$$b^x = b^y \text{ if and only if } x = y$$

$$\log_b x = \log_b y \text{ if and only if } x = y$$

$$b > 0, b \neq 1$$

Solve by Equating Exponents:

1. $16^{2x+3} = \left(\frac{1}{4}\right)^{7x-1}$

$$(4^2)^{2x+3} = (4^{-1})^{7x-1}$$

$$4^{4x+6} = 4^{-7x+1}$$

$$4x+6 = -7x+1$$

$$11x = -5$$

$$x = -\frac{5}{11}$$

2. $\left(\frac{1}{25}\right)^{-3m+1} = 125$

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

$$5^{6m-2} = 5^3$$

$$6m-2 = 3$$

$$6m = 5$$

$$m = \frac{5}{6}$$

Take a logarithm of each side:

3. $11 \cdot 10^{6x} = 55$

$$10^{6x} = 5$$

$$\log 10^{6x} = \log 5$$

$$6x = \log 5$$

$$x = \frac{\log 5}{6}$$

$$x \approx .1165$$

4. $9 \cdot 14^{9n+8} + 7 = 97$

$$9 \cdot 14^{9n+8} = 90$$

$$14^{9n+8} = 10$$

$$\log 14^{9n+8} = \log 10$$

$$(9n+8) \log 14 = 1$$

$$9n+8 = \frac{1}{\log 14}$$

$$9n = \frac{1}{\log 14} - 8$$

$$n = \frac{1}{9 \log 14} - \frac{8}{9}$$

$$n \approx -.7919$$

Exponentiate both sides:

5. $\ln(x-6) - 5 = 4$

(log form) $\ln(x-6) = 9$

(expt form) $e^9 = x-6$

$$e^9 + 6 = x$$

$$8169.6839 \approx x$$

6. $7 + \log_2 b = -3$

$$\log_2 b = -10$$

$$2^{-10} = b$$

$$\frac{1}{2^{10}} = b$$

7. $-7 \log_3(n-10) - 5 = -12$

$$-7 \log_3(n-10) = -7$$

$$\log_3(n-10) = 1$$

$$3^1 = n-10$$

$$13 = n$$

You try! Use all of the powers of your logarithmic universe...

8. $7 - 3e^{-x} = 2$

$$-3e^{-x} = -5$$

(expt form) $e^{-x} = \frac{5}{3}$

(log form) $\ln \frac{5}{3} = -x$

$$-\ln \frac{5}{3} = x$$

$$-.5108 \approx x$$

9. $32 \left(\frac{1}{4}\right)^{\frac{x}{3}} = 2$

$$\left(2^{-2}\right)^{\frac{x}{3}} = \frac{1}{16}$$

$$2^{-\frac{2x}{3}} = 2^{-4}$$

$$\frac{-2x}{3} = -4$$

$$-2x = -12$$

$$x = 6$$