

## Lesson 5.3: Solving Logarithms

1. Isolate Log
2. Eliminate Log
3. Solve.
4. Check for Extraneous

$$f(x) = b^x$$

$$\star f(g(x)) = x$$

$$1. b^{\log_b x} = x$$

$$2. \log_b b^x = x$$

$$g(x) = \log_b x$$

$$g(f(x)) = x$$

$$2 \log_2(\underline{3x-4}) = 3$$

$$3x - 4 = 8$$

$$3x = 12$$

$$\boxed{x=4} \checkmark$$

$$3 \cdot 4 - 4 = 8$$

$$* \log_x(49) = 2$$

$$\sqrt{49} = \sqrt{x^2}$$

$$x = \pm 7$$

-7 extraneous

$$\boxed{x=7}$$

$$\log_3(2x+1) \underset{+7}{-7} = \underset{+7}{-5}$$

$$\underset{3}{\log_3(\underline{2x+1})} = \underset{3}{2}$$

$$2x+1=9$$

$$2x=8$$

$$\boxed{x=4}$$

$$\log_3(9)=2 \checkmark$$

$$\underset{3}{* \log_3(\underline{x^2 - 5x + 3})} = \underset{3}{2}$$

$$x^2 - 5x + 3 = 9$$

$\quad \quad -9 \quad -9$

$$x^2 - 5x - 6 = 0$$

$$(\underbrace{x-6})(\underbrace{x+1}) = 0$$

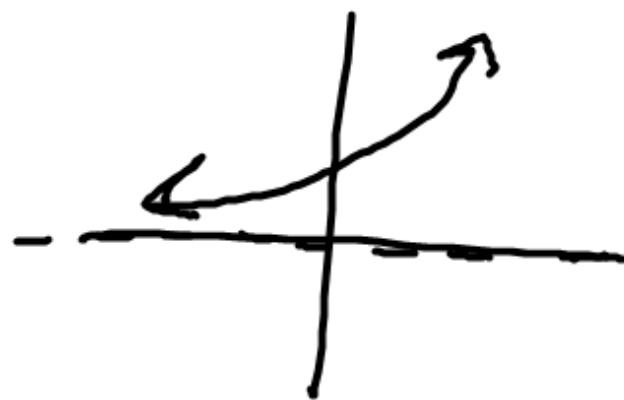
$$\boxed{x=6} \checkmark$$

$$\boxed{x=-1} \checkmark$$

$$\log_3(9)$$

$$3^{\square} = -9$$

$$3^{-2} = \frac{1}{9}$$



~~00~~  $y=0$

$$2x - 7 = \log_3 9$$

$$2x - 7 = 2$$

$$2x = 9$$

$$x = 4.5 \quad \checkmark$$

$$* \log_5 125 = 4x + 5$$

$$3 = 4x + 5$$

$$-2 = 4x$$

$$x = -\frac{1}{2} \quad \checkmark$$

$$\log_e e^{-x+1} = 5 \quad \left\{ \quad \ln e^{-x+1} = 5 \right.$$

$$-x + 1 = 5$$

$$\boxed{x = -4}$$

$$10^{x-3} = 13$$

$$\log_{10} 10^{x-3} = \log_{10} 13$$

$$x-3 = \log(13)$$

+3                      +3

$$x = \log(13) + 3$$

exact answer

$$x \approx 4.11$$

approx. answer

$$* \quad 2^{3x+5} - 4 = 6$$

+4    +4

$$\log_2(2^{3x+5}) = \log_2(10)$$

$$3x+5 = \log_2(10)$$

-5                      -5

$$3x = \log_2(10) - 5$$

$$x = \frac{\log_2(10) - 5}{3}$$

$$* \frac{2e^{3x-2}}{2} = \frac{24}{2}$$

$$\ln(e^{3x-2}) = \ln(12)$$

$$3x-2 = \ln(12)$$

$$3x = \ln(12) + 2$$

$$x = \frac{\ln(12) + 2}{3}$$



Ex: A model for the number  $N$  of people in a college community who have heard a certain rumor is

$$N = P(1 - e^{-0.15d})$$

where  $P$  is the total population of the community and  $d$  is the number of days that have elapsed since the rumor began. In a community of 1000 students, how many days will elapse before 450 students have heard the rumor?

$$N = P(1 - e^{-0.15d})$$

$$\frac{450}{1000} = \frac{1000}{1000}(1 - e^{-0.15d})$$

$$0.45 = 1 - e^{-0.15d}$$

$$\ln 0.55 = \ln(e^{-0.15d})$$

$$\frac{\ln(0.55)}{-0.15} = \frac{-0.15d}{-0.15}$$

$$d = \frac{\ln(0.55)}{-0.15}$$

$$d \approx 3.98 \text{ day}$$