

1) Isolate the base ← add/subtract first
divide last



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2) log/ln of both sides
3) Bring exponent to the front
4) Divide to isolate x

Date _____
Algebra II

Variable Exponential Equations

Use Alpha X to divide

Solve each of the following and round to the nearest hundredth.

1. $3^{2x} = 182$

$\log 3^{2x} = \log 182$
 $2x \log 3 = \log 182$
 $\frac{2x \log 3}{2 \log 3} = \frac{\log 182}{2 \log 3}$
 $x = 2.37$

2. $e^{2n} = 245$

$\ln e^{2n} = \ln 245$
 $\frac{2n \ln e}{2 \ln e} = \frac{\ln 245}{2 \ln e}$
 $n = 2.75$

3. $3(5)^{2x} = 60$

$\frac{3(5)^{2x}}{3} = \frac{60}{3}$
 $\log 5^{2x} = \log 20$
 $\frac{2x \log 5}{2 \log 5} = \frac{\log 20}{2 \log 5}$
 $x = .93$

4. $20e^{4x} = 120$

$\frac{20e^{4x}}{20} = \frac{120}{20}$
 $\ln e^{4x} = \ln 6$
 $\frac{4x \ln e}{4} = \frac{\ln 6}{4}$
 $x = .45$

5. $250(1.04)^{4x} = 500$

$\frac{250(1.04)^{4x}}{250} = \frac{500}{250}$
 $\log 1.04^{4x} = \log 2$
 $\frac{4x \log 1.04}{4 \log 1.04} = \frac{\log 2}{4 \log 1.04}$
 $x = 4.42$

6. $48e^{-12x} = 60$

$\frac{48e^{-12x}}{48} = \frac{60}{48}$
 $\ln e^{-.12x} = \ln 1.25$
 $\frac{-.12x \ln e}{-.12} = \frac{\ln 1.25}{-.12}$
 $x = 1.86$

7. $1.2(4)^{2x} = 20$

$\frac{1.2(4)^{2x}}{1.2} = \frac{20}{1.2}$
 $\log 4^{2x} = \log 16.\bar{6}$
 $\frac{2x \log 4}{2 \log 4} = \frac{\log 16.\bar{6}}{2 \log 4}$
 $x = 1.01$

8. $400(.987)^{2.5x} = 300$

$\frac{400(.987)^{2.5x}}{400} = \frac{300}{400}$
 $\log .987^{2.5x} = \log .75$
 $\frac{2.5x \log .987}{2.5 \log .987} = \frac{\log .75}{2.5 \log .987}$
 $x = 8.79$

$$9. 2(3)^{2x} + 8 = 18$$

$$\begin{array}{r} -8 \quad -8 \\ \hline 2(3)^{2x} = 10 \\ \hline \frac{2(3)^{2x}}{2} = \frac{10}{2} \\ \log 3^{2x} = 5 \end{array}$$

$$\frac{2 \times \log 3 = \log 5}{2 \log 3 \quad 2 \log 3}$$

$$X = .73$$

$$10. 4(2)^{3x} + 8 = 15$$

$$\begin{array}{r} -8 \quad -8 \\ \hline 4(2)^{3x} = 12 \\ \hline \frac{4(2)^{3x}}{4} = \frac{12}{4} \\ \log 2^{3x} = 3 \end{array}$$

$$\frac{3 \times \log 2 = \log 3}{3 \log 2 \quad 3 \log 2}$$

$$X = .53$$

$$11. 8 + 2e^{-5x} = 14$$

$$\begin{array}{r} -8 \quad -8 \\ \hline 2e^{-5x} = 6 \\ \hline \frac{2e^{-5x}}{2} = \frac{6}{2} \\ \ln e^{-5x} = 3 \end{array}$$

$$\frac{-5 \times \ln e = \ln 3}{-5 \quad -5}$$

$$X = -.22$$

$$12. 12 + 2(5)^{8x} = 2000$$

$$\begin{array}{r} -12 \quad -12 \\ \hline 2(5)^{8x} = 1988 \\ \hline \frac{2(5)^{8x}}{2} = \frac{1988}{2} \\ \log 5^{8x} = 994 \\ \frac{8 \times \log 5 = \log 994}{8 \log 5 \quad 8 \log 5} \end{array}$$

$$X = .54$$

$$13. 500e^{\frac{x}{2}} = 200$$

$$\begin{array}{r} \frac{500}{500} \quad \frac{500}{500} \\ \hline \ln e^{\frac{x}{2}} = \ln 4 \\ \frac{2 \times \ln e = \ln 4}{2 \quad 2} \\ \ln e = \ln 4 \\ X = 2 \ln 4 \end{array}$$

$$X = -1.83$$

$$14. 2000(2)^{\frac{x}{4.2}} = 1500$$

$$\begin{array}{r} \frac{2000}{2000} \quad \frac{2000}{2000} \\ \hline \log 2^{\frac{x}{4.2}} = \log .75 \\ \frac{4.2 \times \log 2 = \log .75}{4.2 \quad 4.2} \\ \frac{X \log 2 = 4.2 \log .75}{\log 2 \quad \log 2} \end{array}$$

$$X = -1.74$$

$$15. 1.2(3)^{4.1} + 15 = 195$$

$$\begin{array}{r} -15 \quad -15 \\ \hline 1.2(3)^{4.1} = 180 \\ \hline \frac{1.2(3)^{4.1}}{1.2} = \frac{180}{1.2} \\ \log 3^{4.1} = 150 \\ \frac{4.1 \times \log 3 = \log 150}{4.1 \quad 4.1} \end{array}$$

$$\frac{X \log 3 = 4.1 \log 150}{\log 3 \quad \log 3}$$

$$X = 16.70$$

$$16. 18 - 4(6)^{\frac{x}{3}} = 16$$

$$\begin{array}{r} -18 \quad -18 \\ \hline -4(6)^{\frac{x}{3}} = -2 \\ \hline \frac{-4(6)^{\frac{x}{3}}}{-4} = \frac{-2}{-4} \\ \log 6^{\frac{x}{3}} = \frac{1}{2} \\ \frac{3 \times \log 6 = \log \frac{1}{2}}{3 \log 6 \quad 3 \log 6} \end{array}$$

$$\frac{X \log 6 = 3 \log \frac{1}{2}}{\log 6 \quad \log 6}$$

$$X = -1.16$$