

Name Schlansky
Mr. Schlansky

Date _____
Algebra II

Variable Exponential Equations

Solve each of the following and round to the nearest hundredth if necessary:

1. $10^x = 182$

$$\begin{aligned} \Rightarrow \log 10^x &= \log 182 \\ x \log 10 &= \log 182 \\ \frac{x \log 10}{\log 10} &= \frac{\log 182}{\log 10} \\ x &= 2.26 \end{aligned}$$

3. $\sqrt[3]{3(5)^{2x}} = 60$

$$\begin{aligned} \Rightarrow \log 5^{2x} &= \log 20 \\ \frac{2 \times \log 5}{2 \log 5} &= \frac{\log 20}{2 \log 5} \\ x &= .93 \end{aligned}$$

5. $2(3)^{2x} + 8 = 18$

$$\begin{aligned} \frac{2(3)^{2x}}{2} &= \frac{10}{2} \\ \Rightarrow \log 3^{2x} &= \log 5 \\ \frac{2 \times \log 3}{2 \log 3} &= \frac{\log 5}{2 \log 3} \\ x &= .73 \end{aligned}$$

2. $15^{2n} = 245$

$$\begin{aligned} \Rightarrow \log 15^{2n} &= \log 245 \\ \frac{2 \log 15}{2 \log 15} &= \frac{\log 245}{2 \log 15} \\ n &= 1.02 \end{aligned}$$

4. $4^x - 5 = 12$

$$\begin{aligned} *5 + 5 \\ \log 4^x &= \log 17 \\ \Rightarrow \log 4^x &= \log 17 \\ \frac{x \log 4}{\log 4} &= \frac{\log 17}{\log 4} \\ x &= 2.04 \end{aligned}$$

6. $4(2)^{3x} + 3 = 15$

$$\begin{aligned} \frac{4(2)^{3x}}{4} &= \frac{12}{4} \\ \log 2^{3x} &= \log 3 \\ \Rightarrow \log 2^{3x} &= \log 3 \\ \frac{3 \times \log 2}{3 \log 2} &= \frac{\log 3}{3 \log 2} \\ x &= .53 \end{aligned}$$

$$7. 8 + 2(4)^{-5x} = 14$$

$$\frac{2(4)^{-5x}}{2} = \frac{6}{2}$$

$$\log 4^{-5x} = \log 3$$

$$\frac{-5x \log 4}{\log 4} = \frac{\log 3}{\log 4}$$

$$x = -.16$$

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

$$\frac{2(5)^{8x}}{2} = \frac{1988}{2}$$

$$\log 5^{8x} = \log 994$$

$$\frac{8x \log 5}{\log 5} = \frac{\log 994}{\log 5}$$

$$x = .54$$

$$9. 1 - 2(3)^{2x} = -5$$

$$\frac{-2(3)^{2x}}{-2} = \frac{-6}{-2}$$

$$\log 3^{2x} = \log 3$$

$$\frac{2x \log 3}{2 \log 3} = \frac{\log 3}{2 \log 3}$$

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

$$10. 256 + 3(2)^{6x} = 2700$$

$$\frac{3(2)^{6x}}{3} = \frac{2444}{3}$$

$$\log 2^{6x} = \log 814.\bar{6}$$

$$\frac{6x \log 2}{6 \log 2} = \frac{\log 814.\bar{6}}{6 \log 2}$$

$$x = 1.61$$

$$11. 1.2(3)^{-2x} + 15 = 195$$

$$\frac{1.2(3)^{-2x}}{1.2} = \frac{180}{1.2}$$

$$\log 3^{-2x} = \log 150$$

$$\frac{-2x \log 3}{-2 \log 3} = \frac{\log 150}{-2 \log 3}$$

$$x = -2.28$$

$$12. 18 - 4(6)^{\frac{1}{3}x} = 16$$

$$\frac{-4(6)^{\frac{1}{3}x}}{-4} = \frac{-2}{-4}$$

$$\log 6^{\frac{1}{3}x} = \log \frac{1}{2}$$

$$3 \left(\frac{1}{3} x \log 6 \right) = \left(\log \frac{1}{2} \right) 3$$

$$\frac{x \log 6}{\log 6} = \frac{3 \log \frac{1}{2}}{\log 6}$$

$$x = -1.16$$