

*Chapter 3: Exponential, Logistic, and Logarithmic Functions*

*3.5: Equation Solving and Modeling*

What you'll Learn About

Find the exact solution algebraically, and check it by substituting into the original equation.

$$\frac{1}{4} = \left(\frac{1}{2}\right)^x$$

$$\left(\frac{1}{2}\right)^2 = \frac{1}{4}$$

$$\log 100 = 2$$

$$\log_{10} 100 = 2$$

$$10^2 = 100$$

$$A) \quad \left(\frac{1}{4}\right)^x = \frac{1}{16}$$

$x=2$

$$\left(\frac{1}{4}\right)^2 = \frac{1}{16}$$

$$C) \quad 2(3)^{x/2} = 6$$

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

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

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

$$x = 2$$

$$E) \quad \log x = 5$$

$$10^5 = x$$

$$x = 100,000$$

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

$$x = 6$$

$$B) \quad 20\left(\frac{1}{2}\right)^{x/3} = 5$$

$$20\left[\left(\frac{1}{2}\right)^{\cancel{x}}\right]^{\frac{1}{3}} = 5$$

$$\frac{1}{2}^{\frac{x}{3}} = \frac{1}{4}$$

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

$$D) \quad 2(3)^{-x/2} = 54$$

$$3^{-\frac{x}{2}} = 27$$

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

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

$$x = -6$$

$$F) \quad \log_2(x-4) = 3$$

$$2^3 = x-4$$

$$8 = x-4$$

$$x = 12$$

Solve each equation algebraically

A)  $2.03^x = 5$

$$\ln 2.03^x = \ln 5$$

$$\frac{\ln 5}{\ln 2.03} \neq \ln \left( \frac{5}{2.03} \right)$$

$$e^x = e^{.03x}$$

$$x \ln 2.03 = \ln 5$$

$$x = \frac{\ln 5}{\ln 2.03}$$

B)  $50(e)^{0.03x} = 500$

$$50e^{0.03x} = 500$$

$$e^{0.03x} = 10$$

$$\ln e^{0.03x} = \ln 10$$

$$.03x = \ln 10$$

$$\log_e e^{.03x} \quad x = \frac{\ln 10}{.03}$$

C)  $2\ln(x+3) + 6 = 10$

$$\frac{2\ln(x+3)}{2} = \frac{4}{2}$$

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

$$e^2 = x+3$$

$$x = e^2 - 3$$

D)  $2 - \log(x+3) = 10$

$$-2$$

$$-\log(x+3) = \frac{8}{-1}$$

$$\log(x+3) = -8$$

$$10^{-8} = x+3$$

$$10^{-8} - 3 = x$$

VL

4.5 + 4.7

Due Wed  
11:00 PM