

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.

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

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

C) $\frac{2(3)^{x/2}}{2} = \frac{6}{2}$
 ~~$3 = 3$~~
 ~~$2\left(\frac{x}{2}\right) = (1)2$~~
 $x = 2$

D) $\frac{2(3)^{-x/2}}{2} = \frac{54}{2}$
 $3^{-x/2} = 27$
 $3^{-x/2} = 3^3$
 $-\frac{x}{2} = 3$
 $x = -6$

E) $\log x = 5$
 $10^5 = x$

F) $\log_2(x-4) = 3$
 $2^3 = x-4$
 $8 = x-4$
 $+4 \quad +4$
 $x = 12$

Solve each equation algebraically

A) $2.03^x = 5$

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

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

$$x = \frac{\ln 5}{\ln 2.03} \approx 2.273$$

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

$$e^{.03x} = 10$$

$$\ln e^{(.03x)} = \ln 10$$

$$.03x \ln e = \ln 10$$

$$\frac{.03x}{.03} = \frac{\ln 10}{.03}$$

$$x \approx 76.753$$

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

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

$$2\ln(x+3) = 4$$

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

$$e^2 = x+3$$

$$x = e^2 - 3$$

$$\approx 4.389$$

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

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

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

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

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

$$-3 + \frac{1}{10^8}$$