3.4 Solving Exponential and Logarithmic Equations

Solving Exponential Equations

1.) Isolate the exponential expression

2.) Switch forms

3.) Solve

$2^3 = 8$

$\log_2 8 = 3$

1.) $e^x = 13$

$\rightarrow \log_e 13 = x$

$\ln 13 = x$

$x = 2.565$

2.) $\frac{3(2^x)}{3} = \frac{42}{3}$

$2^x = 14$

$\log_2 14 = x$

$x = 3.807$

Jan 4-3:32 PM

Solving Exponential Equations

3.) $4e^{2x} - 3 = 2$

$\frac{4e^{2x}}{4} = \frac{5}{4}$

$e^{2x} = 5/4$

$\log_e 5/4 = 2x$

$\frac{\ln(5/4)}{2} = x$

$x = .112$

☆

4.) $2(3^{2x-5}) - 4 = 11$

$3^{2x-5} = 7.5$

$\log_3 7.5 = 2x - 5$

$\frac{\log_3 7.5 + 5}{2} = x = 3.417$

Jan 4-3:38 PM

Solving an Exponential Equation in Quadratic Form

5.) $e^{2x} - 3e^{x} + 2 = 0$

$(e^x - 1)(e^x - 2) = 0$

$e^x = 1 \qquad e^x = 2$

$\log_e 1 = x \qquad \log_e 2 = x$

$\ln 1 = x \qquad \ln 2 = x$

$x = 0 \qquad .693 = x$

$x^2 - 3x + 2 = 0$

$(x-1)(x-2) = 0$

$x = 1 \qquad x = 2$

Jan 4-3:39 PM

Solving Logarithmic Equations

6.) $\ln x = 2$

$\log_e x = 2$

$e^2 = x$

$x = 7.389$

7.) $\cancel{\log_3}(5x - 1) = \cancel{\log_3}(x + 7)$

$5x - 1 = x + 7$

$4x = 8$

$x = 2$

Jan 4-3:41 PM

Solving Logarithmic Equations

☆

$$8.)\ 2\log_5(3x) = 4$$

$\log_5 3x = 2$

$5^2 = 3x$

$\frac{25}{3} = \frac{3x}{3}$

$8.333 = x = 25/3$

$\log_5 (3x)^2 = 4$

$5^4 = 9x^2$

$\sqrt{\frac{625}{9}} = \sqrt{x^2}$

$x = 8.3$

Jan 4-3:43 PM

Solving Logarithmic Equations

$$9.)\ \ln(x-2) + \ln(2x-3) = 2\ln x$$

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

$2x^2 \boxed{-3x-4x} + 6 = x^2$

$x^2 - 7x + 6 = 0$

$(x-6)(x-1) = 0$

$x = 6$ $\cancel{x = 1}$

Jan 4-3:43 PM

Solving Logarithmic Equations

10.) $\log_6(3x+14) - \log_6 5 = \log_6 2x$

$\cancel{\log_6}\left(\frac{3x+14}{5}\right) = \cancel{\log_6} 2x$

$\frac{3x+14}{5} = \frac{2x}{1}$

$10x = 3x+14$

$7x = 14$

$x = 2$

Jan 4-3:44 PM

Solving Logarithmic Equations

☆11.) $\log 5x + \log(x-1) = 2$

$\log_{10} 5x(x-1) = 2$

$10^2 = 5x(x-1)$

$5x^2 - 5x - 100 = 0$

$5(x^2 - x - 20) = 0$

$5(x-5)(x+4) = 0$

$x = 5$ $\cancel{x = -4}$

Jan 4-3:45 PM

Jan 7-11:13 AM