12/09

3.4 Solving for Exponential & Log Functions

1) $a^x = a^y$ **Drop the base!**

$x = y$

2) $\log_a x = \log_a y$

$x = y$

3) $a^{\log_a x}$

x

4) $\log_a a^x$

x

Ex. 1

a) $2^x = 32$

$2^x = 2^5$

$x = 5$

b) $\log_4 x = \log_4 8$

$x = 8$

c) $\left(\frac{1}{3}\right)^x = 9$

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

$-x = 2 \Rightarrow x = -2$

Ex. 2

a) $e^x = 72$

$\ln e^x = \ln 72$

$x = \ln 72$

$x \approx 4.28$

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

$(2)^x = 14$

$\log_2 14 = x$

$3.81 \approx x$

Ex. 3.

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

$+4 \quad +4$

$\frac{2}{2}(3^{2x-5}) = \frac{15}{2}$

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

$\log_3 3^{2x-5} = \log_3 7.5$

$2x - 5 = \log_3 7.5$

$+5 \quad +5$

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

$x \approx 3.42$

Extraneous solutions – a solution that does not work!

Ex. 4. Solve for $\ln(x-2) + \ln(2x-3) = 2\ln x$

$$\ln[(x-2)(2x-3)] = \ln x^2$$

$$(x-2)(2x-3) = x^2$$

$$2x^2 - 3x - 4x + 6 = x^2$$

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

$6 \cdot 1 = 6$, $-6 - 1 = -7$

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

$x = 6$ $\qquad$ $x = 1$

↑ Extraneous solution

We cannot take the log of a negative #.