Section 5.4: Solving Log & Exponential Equations

If $a=b$

then: $\log(a) = \log(b)$

and $e^a = e^b$

$10^a = 10^b$

- $\log_a(a^x) = x$
- $\ln(e^x) = x$

- $a^{\log_a(x)} = x$
- $e^{\ln x} = x$

$2^{\log_2(16)} = 16$

$2^4 =$

Solving Exponential Equations

1) Isolate the exponential.
2) Take the appropriate log of both sides (same base)
3) simplify & solve

ex: $5^x = 125$

$\cancel{\log_5} 5^x = \log_5 125$

$x = \frac{\log 125}{\log 5} = 3$

ex: $\frac{\cancel{2}e^{2x}}{\cancel{2}} - 20 = 0$ $+20$ $\frac{+20}{2} = 10$

$e^{2x} = 10$

$\cancel{\ln e}^{2x} = \ln 10$

$\frac{\cancel{2}x}{\cancel{2}} = \frac{\ln 10}{2}$

$x \approx 1.15$

Solving Log Equations

1) Isolate the log.
2) Exponentiate both sides using the appropriate base (same as the log)
3) Simplify & Solve

ex: $\ln(x) = 5$

$$\cancel{e^{\ln}}(x) = e^5$$

$$x = e^5 = 148.4$$

ex: $2\log_5(25x) + 7 = 13$

$$-7 \quad -7$$

$$\frac{2\log_5(25x)}{2} = \frac{6}{2}$$

$$\log_5(25x) = 3$$

$$\cancel{5^{\log_5}}(25x) = 5^3$$

$$\frac{\cancel{25}x}{\cancel{25}} = \frac{125}{25}$$

$$x = 5$$