Section 5.4: Solving Exponential and Log Equations

If $a = b$

- Then $\log(a) = \log(b)$
- And $e^a = e^b$, $10^a = 10^b$

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

$2^{\log_2(16)} = 2^4 = 16$

Solving Exponential Equations

1) Isolate the Exponential
2) Take the appropriate log of both sides (same base)
3) Simplify & Solve.

- $5^x = 125$

$\log_5(5^x) = \log_5(125) = \frac{\log 125}{\log 5} = 3$

$x = 3$

- $2e^{2x} - 20 = 0$

$2e^{2x} = 20$

$e^{2x} = 10$

$\ln(e^{2x}) = \ln(10)$

$\frac{\cancel{2}x}{\cancel{2}} = \frac{\ln(10)}{2} = 1.15$

Solving Log Equations

1) Isolate the Log.
2) Exponentiate both sides using the appropriate base (same as log base)
3) simplify & solve

- $\ln(x) = 5$

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

$x = e^5 = 148.4$

- $2\log_5(x) + 7 = 13$

$2\log_5(x) = 6$

$\log_5(x) = 3$

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

$x = 5^3 = 125$