5.5 - Equations and Inequalities

1. Special Values
   (a) $\log_b b =$
   (b) $\log_b 1 =$

2. $\log_b PQ =$

3. $\log_b \left( \frac{P}{Q} \right) =$

4. $\log_b P^n =$

5. $b^{\log_b P} =$

Properties of Inequalities

If $a \leq b$, then $e^a \leq e^b$.

If $e^a < e^b$, then $a < b$.

If $a < b$, and $e^a < e^b$, then $\ln a < \ln b$.

If $\ln a < \ln b$, then $a < b$. 
Example. Solve for $x$:

- $\log_3 [\log_2 x] = 1$

- $\log_3 [\log_2 [\log_5 [\ln x]]] = 0$
Example. Solve for $x$: (Make sure to check your answers!)

- $\ln x^2 = (\ln x)^2$

- $[\ln x]^2 - 3 \ln x + 2 = 0$
Example. Solve for $x$: (Again, check your answers!)

- $\log_4(x^2 + 6x) = 2$

- $\log x + \log(x + 7) = 1$
Example. Solve for $x$: (Check your answers!)

- $\log_2(x) + \log_2(x - 2) = 3$

- $2 \log x = 1 + \log(x - 1.6)$
**Example.** Solve for the appropriate variable.

- $6^{z+2} = 10$

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

- $2^y \cdot 3^{-y} \cdot 5^{2-3y} = 10^{y+2}$
Example. Solve the following inequalities:

- $6^{x-3} < 2$

- $10^x < 2^{x+1}$
Example. Solve more inequalities:

- $12^{x^2} \geq 12^{3x+4}$

- $\log_2(x - 3) < 4$
Example. Solve more inequalities (Make sure to check your answers!)

- \( \log_2 x + \log_2(x - 3) < 2 \)

- \( \ln x \geq \ln(2x + 4) \)