4.2: Evaluating Logarithms

- Ex 1) Evaluate:

$\log_9 81 = \boxed{2}$

$\log_2 8 = \boxed{3}$

$\log_3 10 = \boxed{2.10}$

$\log_{10} 53 = \boxed{1.72}$

- Natural Logarithm: "ln" means natural log. Natural log can only have a base of e.

- Ex 2) Evaluate $\ln 13 = \boxed{2.56}$

- Ex 3) Solve: $\ln_e(2x+4) = 3$

$e^3 = 2x + 4$

$20.0855\ldots = 2x + 4$

$-4 \quad -4$

$\frac{16.08\ldots}{2} = \frac{2x}{2}$

$\boxed{x = 8.04}$

Solving Logarithmic Equations Using Properties

• Ex 4) Solve $\log_3 5 + \log_3 (x+2) = 4$

Property: $\log_b M + \log_b N = \log_b M \cdot N$

Translation: If two logs with the same base are being added, you can rewrite it as one log by multiplying together what you're taking the log of.

$\log_3 5(x+2) = 4$

$\log_3 (5x+10) = 4$

$3^4 = 5x+10$

$81 = 5x+10$

$-10 \quad -10$

$\frac{71}{5} = \frac{5x}{5}$

$x = 14.20$

• Ex 5) Solve: $\log_8 4x^4 - \log_8 2x^2 = 1$

Property: $\log_b m - \log_b N = \log_b \frac{m}{N}$

Translation: If two logs with the same base are being subtracted, you can rewrite it as one log by dividing what you are taking the log of.

$\log_8 \frac{4x^4}{2x^2} = 1$

$\log_8 2x^2 = 1$

$8^1 = 2x^2$

$\frac{8}{2} = \frac{2x^2}{2}$

$\sqrt{4} = \sqrt{x^2}$

$\boxed{x = 2}$

$\frac{{}^{2}\cancel{4}x^{4-2}}{{}_{1}\cancel{2}\cancel{x^2}}$

• Solve: $\ln(x+2) - \ln 3 = 2$

$\ln_e\left(\frac{x+2}{3}\right) = 2$

$e^2 = \frac{x+2}{3}$

$3(7.39) = \left(\frac{x+2}{3}\right)3$

$22.17 = x + 2$

$-2 \quad -2$

$\boxed{x = 20.17}$