Notes Section 6.4 – Common Logarithms

I can find logarithms using a calculator
I can solve exponential equations using logarithms
I can find logarithms "of any base" using the change of base formula

Common Logarithm: A logarithm with base 10

Use a calculator to evaluate each expression to the nearest ten-thousandth. (use log key on calculator)

1. $\log 15$ 2. $\log 48$ 3. $\log 130$

Change of Base Formula:
If a, b, and c are positive numbers with $b \neq 1$ and $c \neq 1$, then

$$\log_c a = \frac{\log_b a}{\log_b c}$$

or use base 10

$$\log_c a = \frac{\log a}{\log c}$$

Use the change-of-base formula:
Evaluate $\log_6 11$ using common logarithms :

$$\log_6 11 = \frac{\log 11}{\log 6} \approx \frac{1.0414}{0.7782} \approx 1.3383$$

You try ☺
Use the change-of-base formula to evaluate the logarithm:

$\log_{16} 26 =$ $\log_5 13 =$ $\log_3 125 =$

I can solve exponential equations by taking a logarithm of each side:
Solve:

$6^x = 27$

$\log_6 6^x = \log_6 27$

$x = \frac{\log 27}{\log 6} \approx 1.839$

$4^{x-1} = 49$

$\log_4 4^{x-1} = \log_4 49$

$x - 1 = \frac{\log 49}{\log 4}$

$x - 1 = 2.807$ $x = 3.807$

$3^{2x+1} = 12$

$\log_3 3^{2x+1} = \log_3 12$

$2x + 1 = \frac{\log 12}{\log 3}$

$2x + 1 = 2.2619$

$x = 0.6309$

You try ☺
Solve:

$4^x = 32$

$6^{x+3} = 124$

Solve by equating exponents:

$64^x = 16^{x+1}$

$64 = 2^6$

$16 = 2^4$

$64^x = 16^{x+1}$

$(2^6)^x = (2^4)^{(x+1)}$

$2^{6x} = 2^{4x+4}$

$6x = 4x + 4$

$2x = 4$

$x = 2$

Solve each inequality:

$5^x \geq 42$

$\log_5 5^x \geq \log_5 42$

$x \geq \frac{\log 42}{\log 5}$

$x \geq 2.322$

$3^{4x} \geq 72$

$\log_3 3^{4x} \geq \log_3 72$

$4x \geq \frac{\log 72}{\log 3}$

$4x \geq 3.893$

$x \geq 0.973$

$27^{2p-4} \geq 9^p$

$(3^3)^{(2p-4)} \geq (3^2)^p$

$3^{6p-12} \geq 3^{2p}$

$6p - 12 \geq 2p$

$6p \geq 2p + 12$

$4p \geq 12$

$p \geq 3$

You try ☺
Solve each inequality:

$3^x \geq 53$

$2^{3x} \geq 56$

$8^{p-2} \geq 4^p$