4.3, #31,43,47,59,63,105: Simplify the following expressions without using a calculator.

(a). $\log_2\left(\frac{1}{16}\right)$.

(b). $\log 0.00001$.

(c). $\log_3 \sqrt[5]{3}$.

(d). $5^{\log_5(x+y)}$.

(e). $\log_{\sqrt{5}} 1$.

(f). $\log_{16}(\log_{81} 3)$

4.3, #95: Sounds are produced when vibrating objects create pressure waves in some medium such as air. When these variations in pressure reach the human eardrum, it causes the eardrum to vibrate in a similar manner and the ear detects sound. The intensity of sound is measured as power per unit area. The threshold for hearing (minimum sound detectable by a young, healthy ear) is defined to be $I_0 = 10^{-12} W/m^2$. The sound level L, or "loudness" of sound, is measured in decibels (dB) as $L = 10\log\left(\frac{I}{I_0}\right)$, where I is the intensity of the given sound.

(a). Find the sound level of a jet plane taking off if its intensity is $10^{1}5$ times the intensity of I_0.

(b). Find the sound level of the noise from city traffic if its intensity is 10^9 times the intensity of I_0.

(c). How many times more intense is the sound of a jet plane taking off than noise from city traffic?

4.3, #9,15: Convert the following expressions to exponential form.

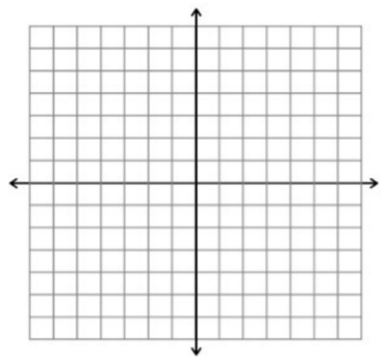
(a). $\log_8 64 = 2$.

(b). $\log_a b = c$.

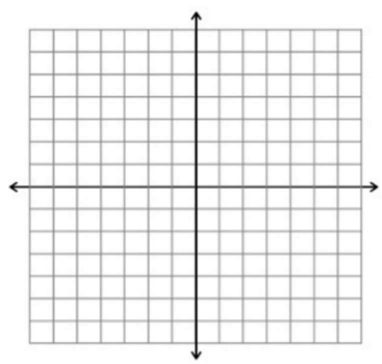
4.3, #23: Convert the equation $a^7 = b$ to logarithmic form.

4.3, #65,67: Graph the following functions.

(a). $f(x) = \log_3 x$.



(b). $g(x) = \log_{\frac{1}{3}}(x)$.



(c). How do these graphs compare? What does this tell you about the transformations one must undergo to become the other?

4.3, #101: Write the equation $\log_4(7x-6) = 4$ in exponential form. Then, use that to solve the original equation, and verify that the solution you found solves the original equation.

4.2, #46: Suppose that \$8,000 is invested at 3.5% interest for 20 years. Compute the interest gained when the investment is compounded:
(a). Annually:

(b). Quarterly:

(c). Monthly:

(d). Continuously:

4.4, #17,39,41: Expand the following expressions without a calculator.
(a). $\log\left(\frac{m^2+n}{100}\right)$

(b). $\log\left(\frac{2x(x^2-3)^8}{\sqrt{4-3x}}\right)$.

(c). $\log_5\left(\sqrt[3]{x\sqrt{5}}\right)$.

4.3 #85,87,117: Identify the domains of the following functions.
(a). $f(x) = \log_4(x^2-16)$.

(b). $m(x) = 3 + \ln\frac{1}{\sqrt{11-x}}$.

(c). $t(x) = \log_4\left(\frac{x-1}{x-3}\right)$.

4.4, #49,59,63: Combine into a single logarithm and simplify where possible
(a). $\log_7 98 - \log_7 2$.

(b). $\ln(x+1) - \ln(x-1)$.

(c). $3\log_4 p + 2\log_4(q^2-16) - 3\log_4(q-4)$.

4.4, #74: Without a calculator, use $\log_b 2 \approx 0.356$ and $\log_b 3 \approx 0.565$ to approximate $\log_b 12$.

4.4, #79 Without using a calculator, place $\log_2 15$ between 2 integers. Then, using a calculator and the change of base formula, approximate $\log_2 15$ to 4 decimal places, checking the result using the related exponential form.