Practice Problems for Math Success
Logarithmic Functions and Properties of Logarithms

These **practice problems** are designed to help you **prepare for our course exams** and **assess your understanding** of the course material at the expected level. Aim to complete them **in class, during tutoring, office hours, or on your own**, and try to solve them **without notes or a calculator**, just like on the **actual exams**. Remember, **practice makes perfect**, so don't hesitate to **ask for help** if you get stuck.

1. (a) The domain of $f(x) = \log(3x - 2)$ is ——————.

   (b) The domain of $f(x) = \ln(x^2)$ is ——————.

   (c) The domain of $f(x) = \ln(x^2 - 9)$ is ——————.

   (d) The domain of $f(x) = \log(\log(x))$ is ——————.

   (e) The domain of $f(x) = \log(10^{-x})$ is ——————.

2. Graph the functions below and label all asymptotes and intercepts.

    (a) $y = \log(x - 4)$

    (b) $y = \ln(x + 1)$

3. Evaluate the following expressions without using a calculator.

    (a) $\log(\log(10))$

    (b) $1000^{\log 3}$

    (c) $\log(\sqrt{10}\,\sqrt[3]{10}\,\sqrt[5]{10})$

    (d) $\sqrt{\log(100)} - \log\sqrt{100}$

4. Evaluate the following expressions without using a calculator.

   (a) $\ln(e^0)$

   (b) $\ln(e^5)$

   (c) $\ln(\sqrt[3]{e})$

   (d) $\ln\left(\dfrac{1}{\sqrt{e}}\right)$

   (e) $e^{\ln(5e)}$

5. Suppose that $x = \log A$ and that $y = \log B$. Write the following expressions in terms of x and y.

(a) $\log(AB)$

(b) $\log(A^3 \cdot \sqrt{B})$

(c) $\log(A - B)$

(d) $\dfrac{\log A}{\log B}$

(e) $\log\left(\dfrac{A}{B}\right)$

(f) AB

6. Suppose that $x = \log(10a)$ and $y = \log(b^2)$ and $z = \log(ab)$, where a and b are positive numbers. For each of the statements below decide whether it is TRUE or FALSE. Justify your answer.

(a) $x = 10\log(a)$

(b) $x = 1 + \log(a)$

(c) $x - 1 + \dfrac{y}{2} = z$

(d) $\log(100a^2b^2) = 2x + y$

(e) $\log\left(\sqrt[3]{10a + b^2}\right) = \dfrac{1}{3}x + y$

(f) $\log\left(\dfrac{a}{b^3}\right) = z - 2y$