Math 111 LP 9, Properties of Logarithms

1. Prove that $\log_a(MN) = \log_a(M) + \log_a(N)$

2. Prove that $\log_a(M^r) = r\log_a(M)$

3. Write the following expressions as a sum or difference of logarithms, pulling any exponents out of the logarithm by the end of the process.

   a. $\log_5\left((2x+1)^{1/2}\cdot(x-3)^2\right)$

   b. $\log_a\left(\dfrac{(x+2)^2}{\sqrt{x}(x+3)^5}\right)$

4. Write each of the following sums or differences of logarithms as a single logarithm.

   a. $\log_3(x+1) + 3\log_3(2x) - 2\log_3(x^2+1)$

   b. $5\log_5(x+3) - \log_5(\sqrt[3]{x+1}) + 5\log_5(x-3)$

5. Approximate $\log_2(7)$ by first rewriting it as an exponential equation and then taking the ln of both sides.

6. Prove the change of base formula $\log_a(M) = \dfrac{\log_b(M)}{\log_b(a)}$ where b is any number you choose so long as $a \neq 1$, $b \neq 1$ and a, b, and M are all positive real numbers.

7. Approximate $\log_2(15)$ by first applying the change of base formula.