Math 181, Fall 2018 Handout: Rules for logarithms

Some basic facts about logarithms:

- $\log_b x$ is the *logarithm to base* b
- The logarithm of x is defined as the power that you need to raise b in order to get x. So $p = \log_b x$ means that $x = b^p$.
- We can state this as a rule: $\log_b b^p = p$.
- In many applications $b = 10$. In computer science, often $b = 2$. In mathematics, $b = e = 2.71828\ldots$ is the base of the natural logarithm, ln.
- The domain of the logarithm is all positive real numbers. The range is all real numbers.
- Explain in your own words why $2^{\log_2 x} = x$, for all $x > 0$.

The logarithm satisfies some handy rules:

- $\log_b b = 1$
- $\log_b 1 = 0$
- $\log_b b^p = p$
- $b^{\log_b x} = x$
- $\log_b(xy) = \log_b x + \log_b y$
- $\log_b(x/y) = \log_b x - \log_b y$
- $\log_b(x^y) = y \log_b x$