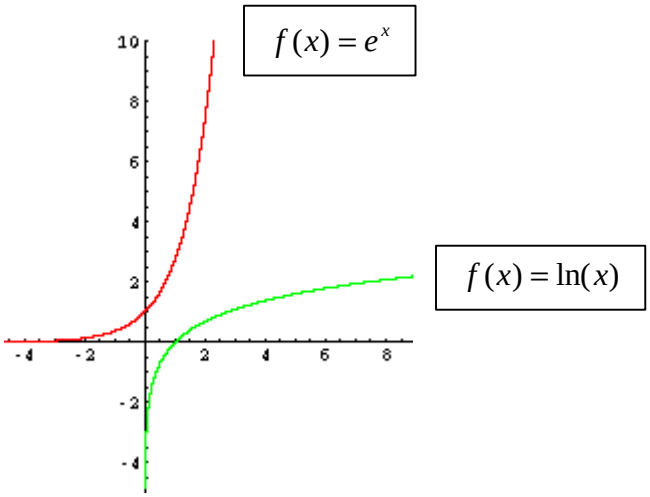
Natural logarithm cheatsheet

The following graphs are of $f(x) = e^x$ and $f(x) = \ln(x)$. Notice they are inverses of each other. Notice the domain of $f(x) = \ln(x)$ is $(0, \infty)$.



Equivalent relationship between exponential equations and logarithmic equations

$x = e^y$ is exactly equivalent to $y = \ln x$

It is often beneficial to interpret this as "ln *x* is the number to which I raise *e* to get *x*".

Logarithm Rules

Let *a* and *c* be positive real numbers. Let *b* be a real number.

1. $\ln(a^b) = b\ln(a)$
2. $\ln 1 = 0$
3. $\ln e = 1$
4. $e^{\ln a} = a$
5. $\ln e^b = b$
6. $\ln(a * c) = \ln a + \ln c$
7. $\ln\left(\frac{a}{c}\right) = \ln a - \ln c$

Derivatives

$\frac{d}{dx}(\ln x) = \frac{1}{x}, \quad x > 0$ $\qquad$ $\frac{d}{dx}(\ln(g(x)) = \frac{g'(x)}{g(x)}$ $\qquad$ $\frac{d}{dx}(\ln|x|) = \frac{1}{x}, \quad x \neq 0$