MATHEMATICS 201-NYB-05
Integral Calculus
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Properties of Exponents and Logarithms

Properties of Exponents and Radicals

$$b^n = \underbrace{b \cdot b \cdot b \cdots b}_{n \text{ times}} \qquad b^0 = 1 \qquad b^{-n} = \frac{1}{b^n}$$

$$b^p b^q = b^{p+q} \qquad \frac{b^p}{b^q} = b^{p-q}$$

$$\left(b^p\right)^q = b^{pq} \qquad (ab)^p = a^p b^p$$

$$\left(\frac{a}{b}\right)^p = \frac{a^p}{b^p} \qquad a^{\frac{1}{n}} = \sqrt[n]{a}$$

$$\sqrt[n]{ab} = \sqrt[n]{a}\sqrt[n]{b} \qquad \sqrt[n]{\frac{a}{b}} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}}$$

$$b^{\frac{m}{n}} = \sqrt[n]{b^m} = \left(\sqrt[n]{b}\right)^m \qquad \sqrt[m]{\sqrt[n]{a}} = \sqrt[n]{\sqrt[m]{a}} = \sqrt[mn]{a}$$

Properties of Logarithms

$$a = b^x \Leftrightarrow x = \log_b a \qquad \log x = \log_{10} x$$

$$\log_b 1 = 0 \qquad \log_b b = 1$$

$$\log_b b^x = x \qquad b^{\log_b x} = x$$

$$\log_b xy = \log_b x + \log_b y \qquad \log_b \tfrac{x}{y} = \log_b x - \log_b y$$

$$\log_b x^r = r \log_b x \qquad \log_b x = \frac{\log_a x}{\log_a x}$$

Definitions of *e*

$$e = \lim_{x \to 0} (1 + x)^{\frac{1}{x}} \qquad e = \lim_{t \to \infty} \left(1 + \tfrac{1}{t}\right)^t$$

Properties of the Natural Logarithm

$$y = e^x \Leftrightarrow x = \ln y \qquad \ln x = \log_e x$$

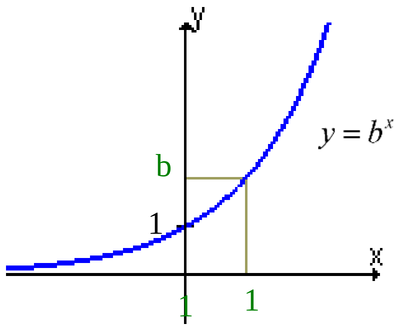
$$\ln 1 = 0 \qquad \ln e = 1$$

$$\ln e^x = x \qquad e^{\ln x} = x$$

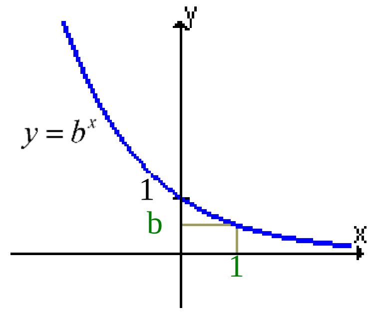
$$\ln xy = \ln x + \ln y \qquad \ln \tfrac{x}{y} = \ln x - \ln y$$

$$\ln x^r = r \ln x$$

Graphs of Exponential Functions

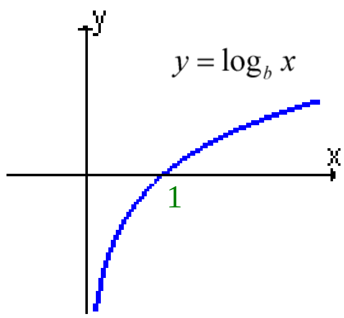


$b > 1$

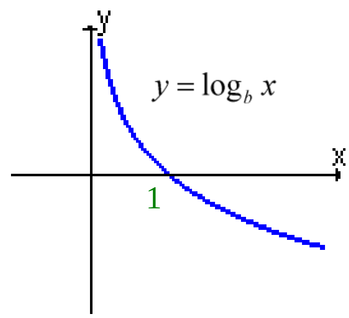


$0 < b < 1$

Graphs of Logarithmic Functions



$b > 1$



$0 < b < 1$