




8.3 Evaluating Logarithms

<p>A Specific Logarithms</p> <p>The logarithm to the base 10 is called <i>decimal</i> or <i>common</i> logarithm. We use the shortcut:</p> $\log_{10} x = \log x$ <p>The logarithm to the base e is called the <i>natural</i> logarithm. We use the shortcut:</p> $\log_e x = \ln x$	<p>B Evaluating Logarithms</p> <p>To evaluate some logarithms, use either:</p> <p>a) the logarithm formula</p> $\log_b b^n = n$ <p>or</p> <p>b) the exponential-logarithmic conversion</p> $y = b^x \Leftrightarrow x = \log_b y$
<p>Ex 1. Use $\log_b b^n = n$ to evaluate each logarithm below.</p> <p>a) $\log_{10} 10 = \log_{10} 10^1 = 1$</p> <p>b) $\log_1 1 = \log_{10} 10^0 = 0$</p> <p>c) $\log 0.01 = \log_{10} 10^{-2} = -2$</p> <p>d) $\ln e^{-3/2} = \log_e e^{-3/2} = -\frac{3}{2}$</p> <p>e) $\log \sqrt{10} = \log_{10} 10^{1/2} = \frac{1}{2}$</p> <p>f) $\ln \sqrt[3]{e^5} = \log_e e^{5/3} = \frac{5}{3}$</p>	<p>Ex 2. Use the exponential-logarithmic conversion to evaluate each logarithm:</p> <p>a) $\log_2 128 = x \Rightarrow 2^x = 128 = 2^7 \Rightarrow x = 7$</p> <p>b) $\log_{1/e} \sqrt{e} = x \Rightarrow \left(\frac{1}{e}\right)^x = e^{-x} = \sqrt{e} = e^{1/2} \Rightarrow x = -\frac{1}{2}$</p> <p>c) $\log_5 625 = x \Rightarrow 5^x = 625 = 5^4 \Rightarrow x = 4$</p> <p>d) $\ln \frac{1}{\sqrt[3]{e}} = x \Rightarrow e^x = \frac{1}{\sqrt[3]{e}} = e^{-1/3} \Rightarrow x = -\frac{1}{3}$</p> <p>e)</p> $\log_{1/2} \sqrt[3]{1024} = x \Rightarrow \left(\frac{1}{2}\right)^x = 2^{-x} = \sqrt[3]{1024} = 2^{10/3} \Rightarrow x = -\frac{10}{3}$ <p>f)</p> $\log_{\sqrt{2}} \sqrt[5]{0.25} = x \Rightarrow \sqrt{2}^x = 2^{x/2} = \sqrt[5]{0.25} = \sqrt[5]{\frac{1}{4}} = 2^{-2/5}$ $\Rightarrow \frac{x}{2} = -\frac{2}{5} \Rightarrow x = -\frac{4}{5}$
<p>C Technology</p> <p>Most scientific calculators have the  key to compute the common (decimal) logarithm and the  key to compute the natural logarithm.</p> <p>Some scientific calculators have the  key to compute logarithms to any base. If not, change the base according to:</p> $\log_b x = \frac{\log x}{\log b} = \frac{\ln x}{\ln b}$	<p>Ex 3. Use technology to evaluate.</p> <p>a) $\ln 7 \approx 1.946$</p> <p>b) $\log 5 \approx 0.699$</p> <p>c) $\log_2 3 = \frac{\log 3}{\log 2} \approx 1.585$</p>

Reading: Nelson Textbook, Pages 459-465

Homework: Nelson Textbook, Page 466: #4, 5, 6, 9, 10, 12, 17, 19, 20, 21