

Logarithmic \rightarrow Exponential Form

$$\begin{array}{l} \text{(base)}^{\text{power}} = \text{answer} \\ 3^2 = 9 \end{array}$$

$$\log_{\text{base}}(\text{answer}) = \text{power}$$

$$\log_3 9 = 2$$

$$\begin{array}{lll} 1) \log_2 8 = 3 & 2) \log_5 5 = 1 & 3) \log_3 \frac{1}{9} = -2 \\ 2^3 = 8 & 5^1 = 5 & 3^{-2} = \frac{1}{9} \end{array}$$

Natural Log is a log of base e

$$\log_e 5 \rightarrow \ln 5$$

$$1) \ln 7 = x \\ e^x = 7$$

$$2) \ln y = .5 \\ e^{.5} = y$$

Exponential \rightarrow Logarithmic Form

$$1) 11^2 = 121 \\ \log_{11} 121 = 2$$

$$2) 2^3 = 8 \\ \log_2 8 = 3$$

$$3) 2^{-2} = \frac{1}{4} \\ \log_2 \frac{1}{4} = -2$$

$$4) e^9 = z \\ \log_e z = 9 \\ \ln z = 9$$

Evaluating Logs

$$1) \log_3 3 = x \\ 3^x = 3 \\ x = 1$$

$$2) \log_4 4^2 = x \\ 4^x = 4^2 \\ x = 2$$

$$3) \log_8 64 = x \\ 8^x = 64 \\ 8^x = 8^2 \\ x = 2$$

$$\log_3 3 = 1$$

$$\log_4 4^2 = 2$$

$$\log_8 64 = 2$$

$$4) \log_3 \frac{1}{27} = x$$

$$3^x = \frac{1}{27}$$

$$3^x = 27^{-1}$$

$$3^x = 3^{-3}$$

$$x = -3$$

$$\log_3 \frac{1}{27} = -3$$

$$5) \log_9 \sqrt{3} = x$$

$$\log_9 3^{\frac{1}{2}} = x$$

$$9^x = 3^{\frac{1}{2}}$$

$$3^{2x} = 3^{\frac{1}{2}}$$

$$2x = \frac{1}{2}$$

$$x = \frac{1}{4}$$

$$\log_9 \sqrt{3} = \frac{1}{4}$$

Side Note

$$\sqrt[2]{3} = 3^{\frac{1}{2}} \quad \sqrt[3]{3} = 3^{\frac{1}{3}}$$

$$\sqrt[4]{3^4} = 3^{\frac{4}{4}}$$

$$6) 10^{\log_{10} 87} = x$$

$$\log_{10} x = \log_{10} 87$$

$$x = 87$$

$$10^{\log_{10} 87} = 87$$

$$7) 2^{\log_2 37} = x$$

$$\log_2 x = \log_2 37$$

$$x = 37$$

$$2^{\log_2 37} = 37$$

$$8) e^{\ln 15} = x$$

$$\ln x = \ln 15$$

$$x = 15$$

$$e^{\ln 15} = 15$$