

Common log - log is base 10

Natural log - ln is base  $e \approx 2.72$

change of base for  $b \neq 1$ ,  $c \neq 1$ ,  $b > 0$ ,  $c > 0$  &  $x > 0$

$$\log_b x = \frac{\log_c x}{\log_c b}$$

$$\log_4 64 = \frac{\log 64}{\log 4} = 3$$

$$\log_{1/3} \left(\frac{1}{7}\right) = \frac{\log \left(\frac{1}{7}\right)}{\log \left(\frac{1}{3}\right)} \approx 1.771$$

$$\log_{1/3} 8 \approx \frac{\log 8}{\log (1/3)} \approx -1.893$$

$$\log_6 \left(\frac{1}{3}\right) = \frac{\log \left(\frac{1}{3}\right)}{\log 6} \approx -0.613$$

Solve

$$16 = 8^{-x-5}$$

$$2^4 = (2^3)^{-x-5}$$

$$2^4 = 2^{-3x-15}$$

$$4 = -3x - 15$$

$$\begin{array}{r} +15 \qquad \qquad +15 \\ \hline 19 = -3x \end{array}$$

$$x = -19/3$$

$$2^{x-9} = 7$$

$$\log (2^{x-9}) = \log 7$$

$$\frac{(x-9) \log 2}{\log 2} = \frac{\log 7}{\log 2}$$

$$x-9 = \frac{\log 7}{\log 2}$$

$$x = \frac{\log 7}{\log 2} + 9$$

$$x \approx 11.81$$

OR

$$2^{x-9} = 7$$

$$\log_2 7 = x-9$$

$$\frac{\log 7}{\log 2} = x-9$$

$$x = \frac{\log 7}{\log 2} + 9$$

Solve for x

$$7^{x+8} = 6$$

$$\log (7^{x+8}) = \log 6$$

$$(x+8) \log 7 = \log 6$$

$$x+8 = \frac{\log 6}{\log 7}$$

$$x = \frac{\log 6}{\log 7} - 8$$

$$x \approx -7.08$$

Solve for x

$$e^{x+8} = 4$$

$$\ln e^{x+8} = \ln 4$$

$$(x+8) \ln e = \ln 4$$

$$x+8 = \ln 4$$

$$x = \ln 4 - 8$$

$$x \approx -6.61$$

Solve for x

$$15^{-x-3} = 7^{6x}$$

$$\log(15^{-x-3}) = \log(7^{6x})$$

$$(-x-3) \log 15 = 6x \log 7$$

$$-x \log 15 - 3 \log 15 = 6x \log 7$$

$$-3 \log 15 = 6x \log 7 + x \log 15$$

$$-3 \log 15 = x (6 \log 7 + \log 15)$$

$$x = \frac{-3 \log 15}{6 \log 7 + \log 15}$$

Solve for x

$$11^{-3x} = 16^{x-5}$$

$$\log 11^{-3x} = \log 16^{x-5}$$

$$-3x \log 11 = (x-5) \log 16$$

$$-3x \log 11 = x \log 16 - 5 \log 16$$

$$-3x \log 11 - x \log 16 = -5 \log 16$$

$$x(-3 \log 11 - \log 16) = -5 \log 16$$

$$x = \frac{-5 \log 16}{-3 \log 11 - \log 16} = \frac{5 \log 16}{3 \log 11 + \log 16}$$