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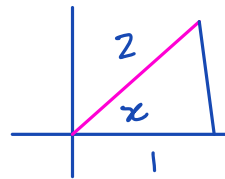
Learning Goal 7.1	Applying one or more transformations to exponential and logarithmic functions, including translations, stretches and reflections.
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Example Solve algebraically, if possible.

a. $2x - 7 = 9$

$$\begin{aligned} &+7 \quad +7 \\ 2x &= 16 \\ \frac{2x}{2} &= \frac{16}{2} \\ x &= 8 \end{aligned}$$

b. $\cos x = \frac{1}{2}, 0 \leq x < \pi$



$$x = \frac{\pi}{3}$$

c. $8^x = 10$

$$\begin{aligned} 2^x &= 10 \\ x &= \log_2 10 \end{aligned}$$

We can undo an exponential with a logarithm.
 ↳ the logarithm is the inverse of an exponential.

$$y = b^x \iff \log_b y = x$$

- **Common Logarithm** assumes a base, b , of 10

$$\log y = x$$

↳ assume the base is 10 when we don't write anything.

- **Natural Logarithm**

assumes a base, b , of the number e (≈ 2.71828) (Euler's constant)

$$\ln y = x \iff \log_e y = x$$

- **Important Identities**

$$b^0 = 1$$

$$b^1 = b$$

$$b^x = b^x$$

$\log_b 1 = 0$	$\log_b b = 1$	$\log_b b^x = x$
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Example Express each expression in logarithmic form.

a. $n = 4^x$
 $y = b^x$
 $\log_b y = x$
 $\log_4 n = x$

b. $2^7 = 128$
 $\log_2 128 = 7$

c. $5^{-3} = \frac{1}{125}$
 $\log_5 \left(\frac{1}{125} \right) = -3$

Example Express each ~~expression~~ ^{equation} in exponential form.

a. $\log_{10} 1000 = 3$

$10^3 = 1000$

b. $\log_2 \left(\frac{1}{8} \right) = -3$

$2^{-3} = \frac{1}{8}$

c. $\ln e = 1$

$e^1 = e$

Example Evaluate each logarithm without using a calculator.

a. $\log_3 81 = x$

$3^x = 81$

$x = 4$

b. $\log_4 \left(\frac{1}{16} \right) = y$

$4^y = \frac{1}{16}$

$y = -2$

c. $\log_{10} 0.01 = n$

$10^n = 0.01$

$= \frac{1}{100}$

$n = -2$

Example Evaluate 3^m if $m = \log_2 8$.

$2^m = 8$

$m = 3$

$3^m = 3^3$

$= 27$

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

Because the exponential function is the inverse function of logarithm.