Section 3.4 day 1	Solve Exponential Equations
Objective	Given an exponential equation students will use the definition of logarithms to solve for the value of x.

Study Problems

Page 254 #1-3,17-23 odd, 27, 45-53 odd

Due Tuesday

Example

Determine whether each value is a solution to the equation.

$$2^{3x+1} = 32$$

~~a. $x = -1$~~ NO

~~b. $x = 2$~~ NO

~~c. $x = 0$~~ NO

c) $2^3 = 8$

~~$8^{x+1} =$~~

~~$x = 3$~~

a) $2^{3(-1)+1} =$

2^{-3+1}

$2^{-2} = 1/4 \neq 32$

b) $2^{3(2)+1}$

$2^7 = 128 \neq 32$

Example

Find the value of x.

$a.\ 36=\left(\frac{1}{6}\right)^{11-x}$

$36=\left(\frac{1}{6}\right)^{11-x}$

$6^2=\left(6^{-1}\right)^{11-x}$

$2=-1(11-x)$

$2=-11+x$

$\boxed{x=13}$

What is the additional step needed to solve:

$36=\left(\frac{1}{6}\right)^{11-x}+12$

$-12 \qquad -12$

$24=\left(\frac{1}{6}\right)^{11-x}$

$\log_{\frac{1}{6}} 24=11-x$

$\frac{\ln 24}{\ln 1/6}$ or $\frac{\log 24}{\log 1/6}=11-x$

$x-1.77=11-x$

$+x$

$x-1.77=11$

$x=12.77$

Example

Find the value of x.

$b.\ 81^x+3=27$

$81^{.723}+3\approx 27$

$81^x=24$

$\log_{81} 24=x$

$\frac{\log 24}{\log 81}=x$

$0.723=x$

What if we had $2\cdot 81^x+3=27$

what would we do first?

$\frac{2\cdot 81^x}{2}=\frac{24}{2}$

$81^x=12$

$\log_{81} 12=x$

$\frac{\log_{10} 12}{\log_{10} 81}=\frac{\ln_e 12}{\ln_e 81}=x$

$0.565=x$

Example

Find the value of x.

$$a.\ \frac{1}{4}\cdot 27^{x-4}-11=5$$

$$\frac{\frac{1}{4}\cdot 27^{x-4}}{1/4}=\frac{16}{1/4}$$

$$27^{x-4}=64$$

$$\log_{27}64=x-4$$

$$\frac{\log 64}{\log 27}=x-4$$

$$1.262=x-4$$

$$\boxed{x=5.262}$$

How can you check your solution?

Example

Find the value of x.

$$a.\ e^{x}+6=21$$

$$e^{x}+6=21$$

$$e^{x}=15$$

$$\ln_e 15=x$$

$$\frac{\ln 15}{\ln e}=x$$

$$x=2.71$$

Describe how to evaluate a exponential equation.