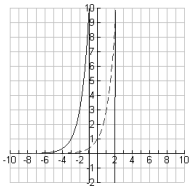
6:1 Exponential Functions

Example 2: Using horizontal shifts to sketch graphs.

Sketch the graph of the function:

$h(x) = (3)^{x+3}$

Solution: To sketch h(x), shift $h(x) = 3^x$ three units *left.*



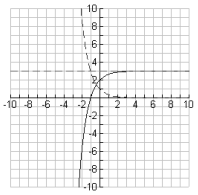
6:1 Exponential Functions

Example 3: Using Reflection and Shifts

Sketch the graph of

$h(x) = -\left(\frac{1}{3}\right)^x + 3$

Solution: To sketch h(x), reflect the graph of $f(x) = \left(\frac{1}{3}\right)^x$ in the x-axis, then shift upward 3 units



6:1 Exponential Functions

Example 4:Evaluate powers that have rational and irrational exponents.

Use a calculator to evaluate the power:

	Rational	Irrational
a.	$3^{\frac{2}{3}}$	b. $3^{-\pi}$

Solutions: Using a scientific calculator:

3 $\boxed{y^x}$ (2 ÷ 3) $\boxed{=}$ 2.08008

Using a graphing calculator:

3 $\boxed{\wedge}$ $(2 \div 3)$ $\boxed{\textit{enter}}$ *2.08008*

6.3 Logarithmic Functions

We studied $3^2 = 9$ and $3^3 = 27$. How could you find what value of x would give you a solution to $3^x = 12$? In the notation of logarithms, if $3^x = 12$ then x = 2.26.

See the example: $3^2 = 9$

$\log(3)^2 = \log 9$

$2\log(3) = \log 9$

$2 = \frac{\log 9}{\log 3}$

6:3 Logarithmic Functions

Definition of logarithms to the base *a*

Let *a* and *x* be positive numbers and *a*.

The logarithm of *x* with base *a* is given by and is defined.

$y = \log_a x$ *if and only if* $x = a^y$

number

base

logarithm or exponent

6:3 Logarithmic Functions

Example 1: Rewriting Exponential and Logarithmic Equations

	Logarithmic form	**Exponential Form**
a.	$4 = \log_3 81$	$81 = 3^4$
b.	$y = \log_5 x$	$x = 5^y$
c.	$5 = \log_a 4$	$a^5 = 4$
d.	$-3 = \log_e b$	$e^{-3} = b$
e.	$\log_3 5 = c$	$3^c = 5$