Logarithmic Functions

Section 8.4

Evaluating Logarithms

- $2^2 =$
- $2^3 =$
- $2^x = 6$

Exponential Form $\longleftrightarrow$ Logarithmic Form

$$b^e = a$$

$$\log_b a = e$$

Convert Between Forms

Logarithmic Form	Exponential Form
$\log_2 32 = 5$	
	$5^0 = 1$
$\log_{10} 10 = 1$	
	$10^{-1} = 0.1$
$\log_{1/2} 2 = -1$	
	$\left(\dfrac{1}{2}\right)^{-3} = 8$
$\log_8 1 = 0$	
	$5^{-2} = \dfrac{1}{25}$

Evaluating Logarithms

Evaluate the expressions:

a.) $\log_3 81$ b.) $\log_5 0.04$ c.) $\log_{0.5} 8$ d.) $\log_9 3$

e.) $\log_4 64$ f.) $\log_2 0.125$ g.) $\log_{0.25} 256$ h.) $\log_{32} 2$

Special Logarithms

Common Logarithm

- Logarithm with a base of 10

$$\log_{10} x = \mathbf{\log x}$$

Evaluate:
a) $\log 10$
b) $\log 100$
c) $\log 5$

Natural Logarithm

- Logarithm with a base of e

$$\log_e x = \mathbf{\ln x}$$
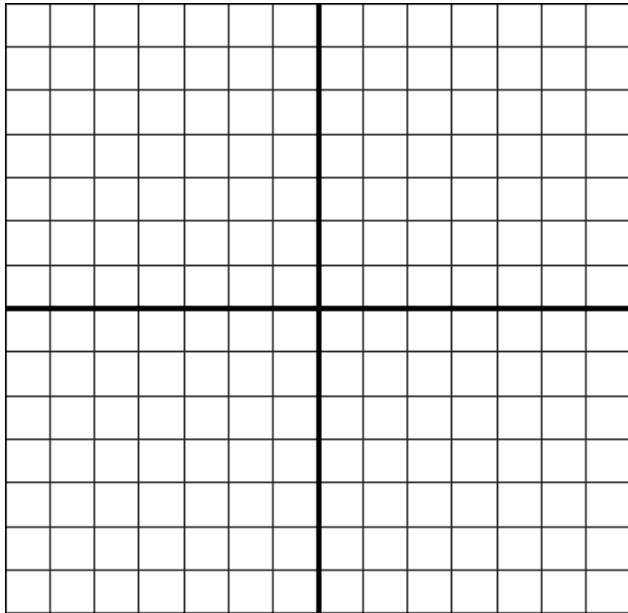
Evaluate:
a) $\ln e$
b) $\ln 7.4$
c) $\ln 0.38$

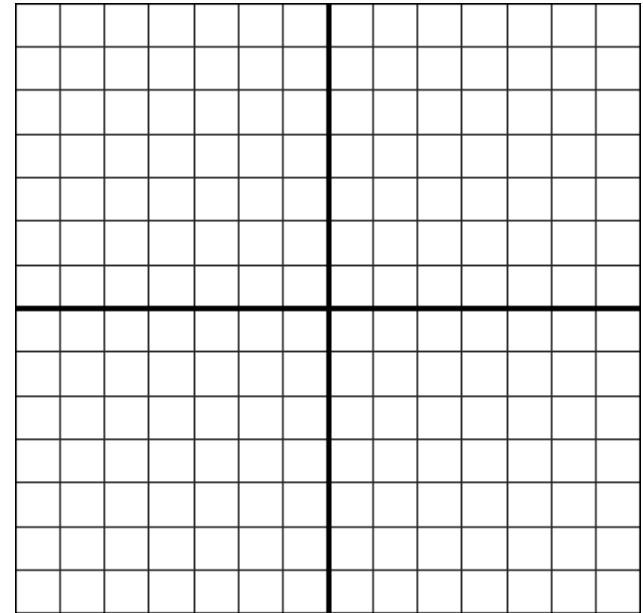# Graphing Logarithmic Functions

$$y = \log_b(x - h) + k$$

- $x = h$ is a vertical asymptote
- $D: (h, \infty)$
- $R: (-\infty, \infty)$
- If $b > 1$, the graph moves up and to the right
- If $b < 1$, the graph moves down and to the right
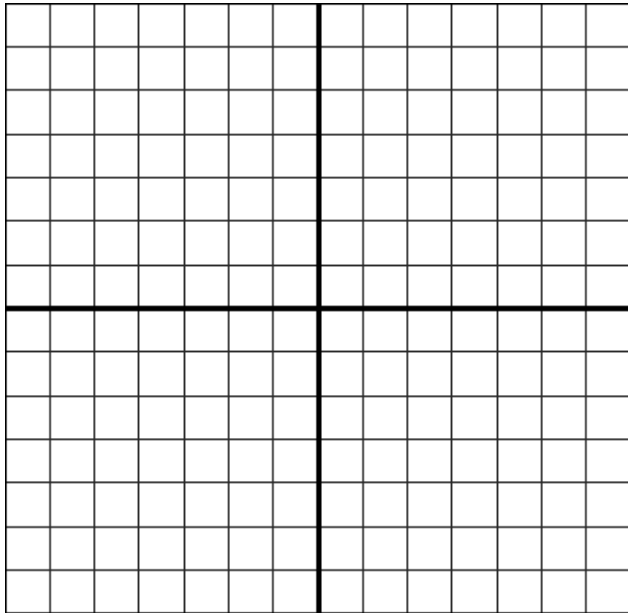
Graph the functions
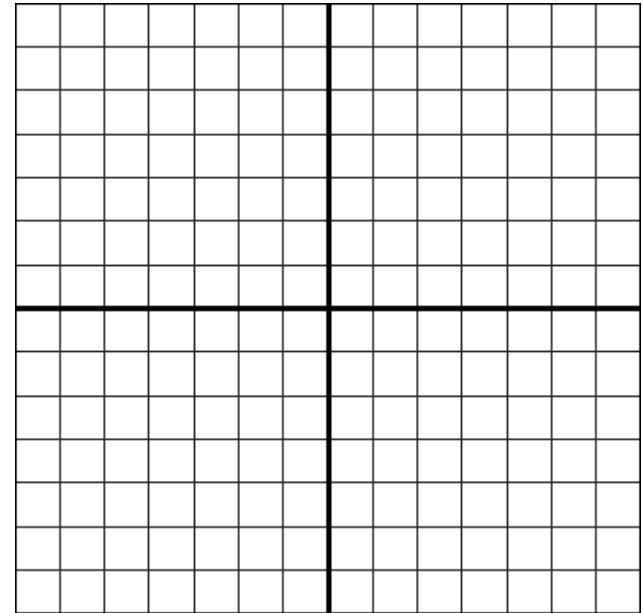
- $y = \log_{1/3}(x) - 1$

- $y = \log_5(x + 2)$

Graph the functions

- List Parent Graph
- List Transformations
- Plot 2 points
- List/draw VA
- State D and R

- $y = \log_{1/2}(x) + 4$

- $y = \log_3(x - 2)$

Special Logarithm Values

Logarithm of 1	$\log_b 1 = 0$ because $b^0 = 1$
Logarithm of base b	$\log_b b = 1$ because $b^1 = b$

Practice

- Textbook page 490-1
- #16 – 23 (converting)
- #24 – 35 (evaluate)
- #67, 71, 73, 75 (graphing)
- #79, 81 (apps)