1. (a) Complete the tables below for the given exponential and logarithmic functions.

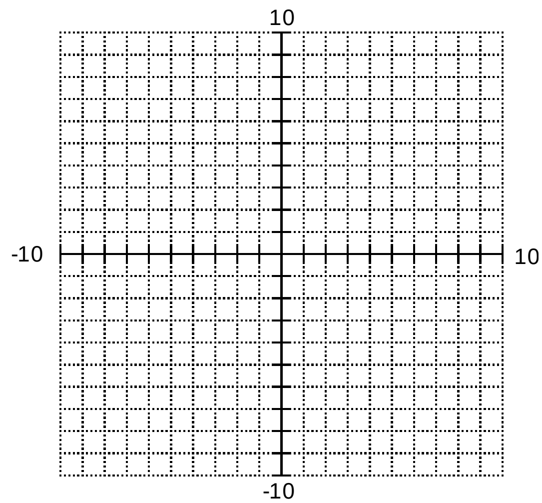
$y = 3^x$

x	y
-3	
-2	
-1	
0	
1	
2	
3	
5	

$y = \log_3 x$

x	y
	-3
	-2
	-1
	0
	1
	2
	3

(b) Graph these two functions along with y = x on the coordinate grid. Include any asymptote(s) and intercept(s).



(c) What do you notice about the tables in part (a)? What do you notice about the graphs?

Conversions from one form to another

Use $\mathbf{\log_a x = y}$ ↔ $\mathbf{a^y = x}$

2. Complete the chart, converting the given equation from one form to the other.

Logarithmic form	**Exponential form**
(a) $\log_3 81 = 4$	
(b) $\log 0.001 = -3$	
(c)	$7^5 = 16{,}807$
(d)	$e^{2.9957} \approx 20$
(e) $\log_5 1 = 0$	
(f)	$12^1 = 12$
(g) $\ln 39 \approx 3.6636$	

3. Evaluate <u>without a calculator</u>. Give exact answers, whenever possible. Show your reasoning.

(a) $\log_2 64$ (b) $\log 100{,}000{,}000$ (c) $\log_3 1$

Calculator Keys:

Common logarithm LOG $= \log_{10}$ Natural logarithm LN $= \log_e$

4. Evaluate. Use your calculator to approximate these to 4 decimal places.

(a) log 153 (b) log 0.0005 (c) ln 44

Solving logarithmic equations:

Use (1) changing forms or (2) $\log_a u = \log_a v \leftrightarrow u = v$

or (3) $a^u = a^v \leftrightarrow u = v$

5. Solve for x. Give exact answers, if possible.

(a) $\log_3 x = 10$ (b) $e^{2x} = 5$ (c) $10^{x+3} = 10{,}000{,}000$

"Log Rules"	
1. $\log_b b = 1$ because $b^1 = b$	5. $\log_b M \cdot N = \log_b M + \log_b N$ since $b^M \cdot b^N = b^{M+N}$
2. $\log_b 1 = 0$ because $b^0 = 1$	6. $\log_b \frac{M}{N} = \log_b M - \log_b N$ since $\frac{b^M}{b^N} = b^{M-N}$
3. $\log_b b^n = n$ because $b^n = b^n$	7. $\log_b M^p = p \cdot \log_b M$ since $(b^M)^p = b^{M \cdot p}$
4. $b^{\log_b n} = n$ because $\log_b n = \log_b n$	8. $\log_b M = \frac{\log_a M}{\log_a b}$

6. Fill in the blanks using the log rules

(a) log 3 + log 5 = log ___ (b) ln 20 – ln 10 = ln ___ (c) $\log_3 4^5 =$ ___$\cdot \log_3 4$

(d) $8^{\log_8 1.25} =$ _____ (e) $\log 10^{4.5} =$ _____

7. Evaluate. Use your calculator to approximate these to 4 decimal places.

(a) $\log_2 16$ (b) $\log_7 28$ (c) $\log_5 1000$

8. Given that $\log_{10} 2 \approx 0.301$, find each of the following.

(a) $\log_{10} 4$ (b) $\log_{10} 2000$ (c) $\log_{10} 5$

8. How would you enter $y = \log_2 x$ on a graphing calculator?

What about $y = \log_5 x$?

Simple Interest

10. Invest $1,000 at 4% for 3 years. Find the accumulated amount.

Compound Interest

11. Invest $1,000 at 3.5% compounded __________ for 5 years. Find the accumulated amount.

(a) monthly (b) quarterly (c) continuously

12. The formula $A = Pe^{(APR \cdot Y)}$ gives the accumulated amount (A) of an investment when P is the initial investment, APR is the annual interest rate, and Y is the time in years, assuming continuous compounding and no deposits or withdrawals.

For an initial investment of $2,000, compounded continuously at a 7% annual interest rate, find to the nearest tenth of a year when this investment doubles in value.

13. The formula for the accumulated amount, A, of an investment (or loan) is given by the formula,

$A = P\left(1+\frac{APR}{n}\right)^{(n \cdot Y)}$, where P is the principal, APR is the annual interest rate, and n is the annual number of interest periods, and Y is the number of years.

For an initial investment of $2,000, compounded monthly at a 2% annual interest rate, find to the nearest tenth of a year when this investment doubles in value.

14. For an initial investment of $1,000, compounded annually at a 4.5% annual interest rate, find to the nearest tenth of a year when this investment doubles in value.

Complete the table:

APR	3.5%	5%	7%	10%
T_{double} (using 70/P formula)				
T_{double} (using log formula)				
T_{double} (exact, assuming n = 12)				