3.6	#15-39odd	Solving polynomial inequalities
	#47, 53-61odd	Solving rational inequalities
3.7:	#23-37 odd	Variation
4.1	#17-23 odd	prove f is one-to-one; prove g is not one-to-one
	#59-63 odd	determine if f is on-to-one and if so, determine its inverse
	#77-81 odd	sketch the inverse function by reflecting over y=x
	#83-87 odd	use composition to show that the functions are inverses
4.2	#5-10all	match an exponential function to its graph
	#11-41odd	sketch graphs of exponential functions using transformations
	#43a,b,c,45,47	compound interest word problems
4.3	#1-8all	sketch graphs of logarithmic functions
	#9-33odd	evaluate log expressions without a calculator
	#35-53 odd	convert between logarithmic and exponential expressions
	#69-77 odd	apply change of base formula & calculator to approximate log expressions
	#83-90 all	graph logarithmic functions using transformations
4.4	# 31,33, 49-55 odd; 65-75 odd; 107	applying log rules

Solve: $(x+4)(x-2)(x-6) \le 0$.

a) $(-4,2) \cup (6,\infty)$ b) $[-4,2] \cup [6,\infty)$

c) $(-\infty,-4) \cup (2,6)$ d) $(-\infty,-4] \cup [2,6]$

Solve: $\frac{x-2}{x+5} \geq 3$.

a) $\left[-\frac{17}{2}, -5\right)$ b) $\left(-\infty, -\frac{17}{2}\right]$

c) $\left(-\infty, -\frac{17}{2}\right] \cup (-5, \infty)$ d) $\left[-\frac{17}{2}, -5\right]$

If y varies inversely as x and $y = 12$ when $x = 30$, find y when $x = 5$.

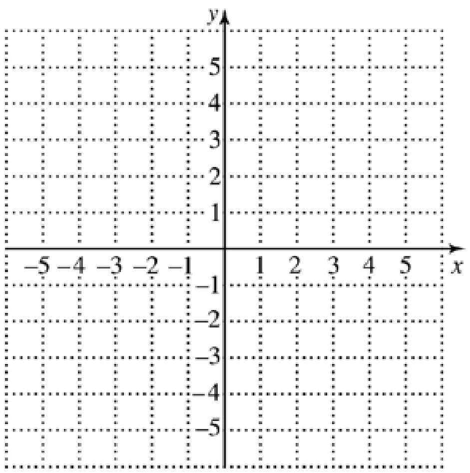
a) 2 b) 72 c) -2 d) $\frac{1}{72}$

Find a formula for the inverse of the function $f(x)=\dfrac{x}{x-5}$.

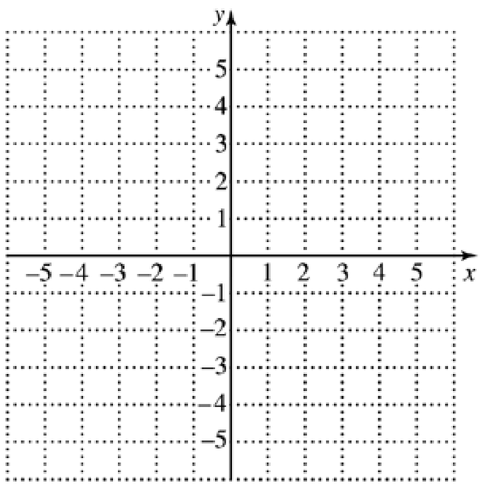
a) $f^{-1}(x)=\dfrac{5}{x-1}$ b) $f^{-1}(x)=\dfrac{5x}{x-1}$

c) $f^{-1}(x)=\dfrac{x}{x+5}$ d) Does not exist

5. Graph $f(x)=\left(\frac{1}{2}\right)^{x}$



6. Graph $f(x)=\log_4 x$



5. Describe how the following transformations affect the graph of the original untransformed function (e.g. "shift up 2" or "stretch vertically by a factor of 3 and flip upside down" etc.):

A. The +3 in $f(x) = |x + \mathbf{3}|$

B. The 5 in $f(x) = \mathbf{5}\sqrt[3]{x}$

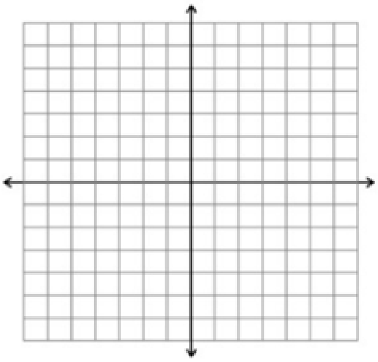
C. The − in $f(x) = -x^2$

D. The −4 in $f(x) = \frac{1}{x} - \mathbf{4}$

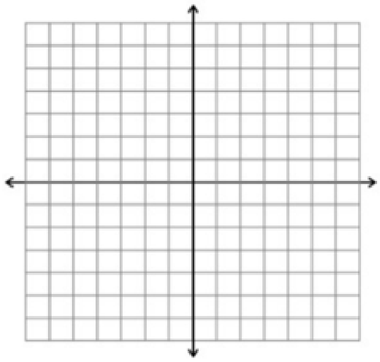
I. The Basics. Apply rules of logarithms and exponents to evaluate each expression.

1. $\log \frac{1}{1000} =$
2. $\log_8 32 =$
3. $\log_2 1 =$
4. $\ln \sqrt[3]{e} =$
5. $3^{2 \log_3 4} =$

10. $y = \log_2(x+3) + 1$



11. $y = e^x - 4$



Express in terms of sums and differences of simple logarithms, and simplify:

9. $\log_a \sqrt{\dfrac{a^6 b^8}{a^2 b^5}}$

Express as a single logarithm, and simplify:

10. $\ln x - 3[\ln(x-5) + \ln(x+5)]$

a. $\frac{2}{3}[\ln(x^2-9)-\ln(x+3)]+\ln(x+y)$

b. $\ln 2x+3(\ln x-\ln y)$

a. $\log\sqrt{x^3y}$

b. $\log_c\sqrt[3]{\frac{y^3z^2}{x^4}}$

8. (10 points) Find an equation of variation where *y* varies jointly as the square of *x* and the square of *z* and inversely as *w*, and *y* = 50 when *x* = 2 , *z* = 5 , and *w* = 10 .

7.Given that $\log_b 2 \approx 0.693$, $\log_b 3 \approx 1.099$, $and \log_b 5 \approx 1.609$, find the following to the nearest thousandth.

a. $\log_b \frac{1}{6}$

b. $\log_b 30$

8. Simplify.

a. $5^{\log_5(4x-3)}$

b. $\log_b \sqrt{b^3}$

3. Find each of the following without using a calculator. Show the intermediate steps that led to the answer. Give exact answers.

a. $log_2 \frac{1}{4}$

b. $\log \sqrt{10}$

c. $\ln \frac{1}{e^5}$

a. $f(x) = 2^{x+3} - 5$

b. $f(x) = log_3 x - 1$

1. Determine whether the function is one-to-one, and if it is one-to-one, find a formula for its inverse.

a. $f(x) = 2x - 1$

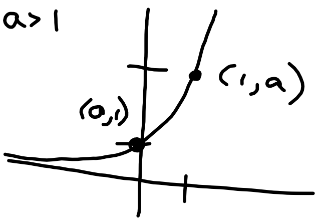
b. $f(x) = \frac{4}{x+7}$

Properties of Exponential Functions

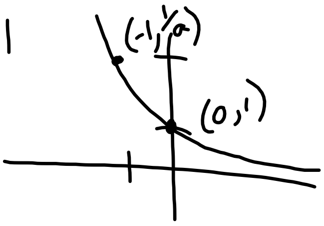
$f(x) = a^x$, $a > 0$, $a \neq 1$

- continuous
- one-to-one
- Domain: $(-\infty, \infty)$
- Range: $(0, \infty)$
- Horizontal asymptote: $y = 0$
- y-intercept: $(0, 1)$
- increasing if $a > 1$
- decreasing if $0 < a < 1$

$a > 1$



$0 < a < 1$



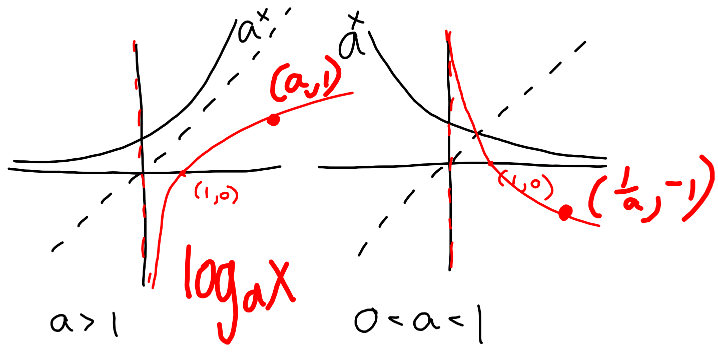
Application: Compound Interest

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

A = amount of money
P = principal (initial investment)
t = time in # of years
r = interest rate (decimal)
n = # of times interest is compounded per year

For $f(x) = a^x$, the inverse function is $f^{-1}(x) = \log_a x$.
$y = \log_a x$ is the number y such that $x = a^y$, where $x > 0$ and a is a positive constant other than 1.

log graphs:
Vertical asymptote @ $x = 0$
x-int: (1, 0)
domain: $(0, \infty)$
range: $(-\infty, \infty)$



<u>Properties of Exponential Functions</u>:

$a^m a^n = a^{m+n}$

$\frac{a^m}{a^n} = a^{m-n} = \frac{1}{a^{n-m}}$

$(a^m)^n = a^{mn}$

$(a^p b^q)^r = a^{pr} b^{qr}$, $\left(\frac{a^p}{b^q}\right)^r = \frac{a^{pr}}{b^{qr}}$

$a^{-1} = \frac{1}{a}$

$a^0 = 1, a \neq 0$

<u>Properties of Logarithmic Functions</u>:

Product Rule: $log_a(MN) = log_a M + log_a N$

Power Rule: $log_a(M)^P = p\, log_a M$

Quotient Rule: $log_a\left(\frac{M}{N}\right) = log_a M - log_a N$

Change of Base Formula: $log_b M = \frac{log_a M}{log_a b}$

Other Properties: $log_a a = 1$ $\quad log_a 1 = 0$

$log_a a^x = x$ $\quad a^{log_a x} = x$

$\ln x = \log_e x$ $\quad \log x = \log_{10} x$