Intermediate Algebra
Chapter 8 Test Review

Name: Key

THE FOLLOWING WILL BE NON-CALCULATOR

1) Change the following to either exponential or logarithmic form.

a) $\log_3 243 = 5$

$3^5 = 243$

b) $7^2 = 49$

$\log_7 49 = 2$

2) Evaluate the following.

a) $\log_5 \frac{1}{25} =$ -2 b) $\log_4 4 =$ 1 c) $\log_{36} 6 =$ $\frac{1}{2}$ d) $\log_3 27 =$ 3

$5^x = \frac{1}{25}$ $4^x = 4$ $36^x = 6$ $3^x = 27$

$\sqrt{36} = 6$

Graph each of the following functions with **at least two points and the asymptote** and fill in the indicated information. log functions have vertical asymptotes

3) $y = \log_2 x$

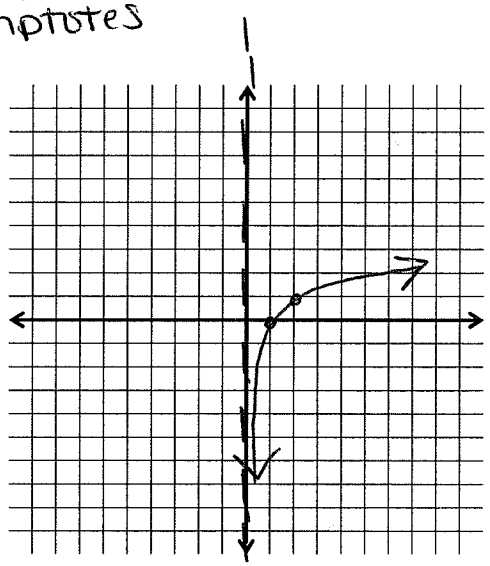
x	y
1	0
2	1

Transformations: none

Asymptote: $x = 0$

Domain: $(0, \infty)$ Range: $(-\infty, \infty)$

x-intercept: $(1, 0)$ y-intercept: none



$y = \log_4 x$

4) $y = \log_4(x + 2) - 1$

x	y
1	0
4	1

Transformations: left 2, down 1

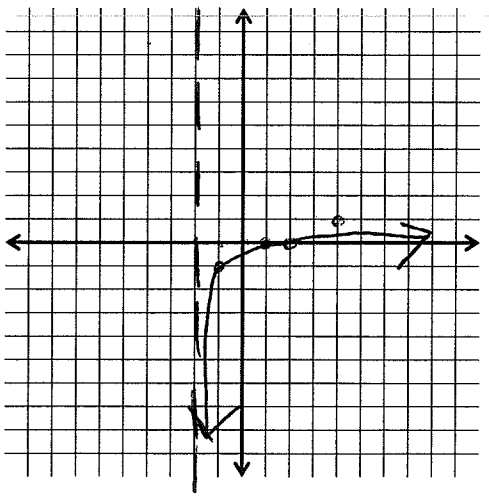
Asymptote: $x = -2$

Domain: $(-2, \infty)$ Range: $(-\infty, \infty)$

x-intercept: $(2, 0)$ y-intercept: $(0, -\frac{1}{2})$

$y = \log_4(0+2) - 1$

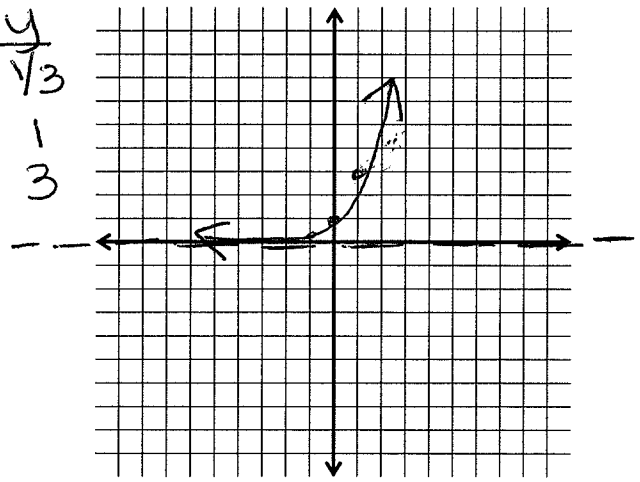
$= -\frac{1}{2}$



* exponential functions have horizontal asymptotes!

5) $y = (3)^x$

x	y
-1	1/3
0	1
1	3



Describe the shift: none

Asymptote: $y=0$

Domain: $(-\infty, \infty)$ Range: $(0, \infty)$

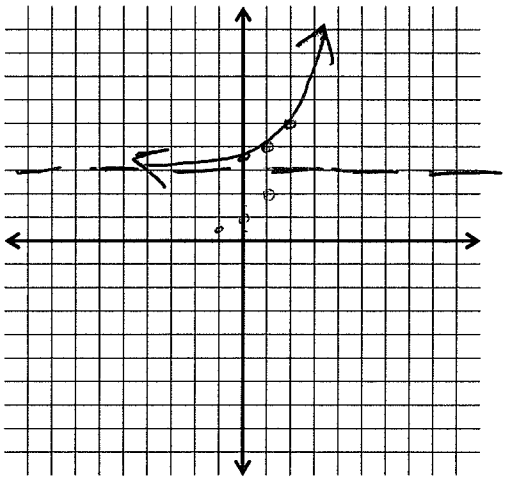
x-intercept: none y-intercept: $(0,1)$

Growth or Decay?

parent $\rightarrow y = 2^x$

6) $y = (2)^{x-1} + 3$

x	y
-1	1/2
0	1
1	2



Describe the shift: right 1, up 3

Asymptote: $y=3$

Domain: $(-\infty, \infty)$ Range: $(3, \infty)$

x-intercept: none y-intercept: $(0, 3.5)$

Growth or Decay?

$y = (2)^{0-1} + 3$

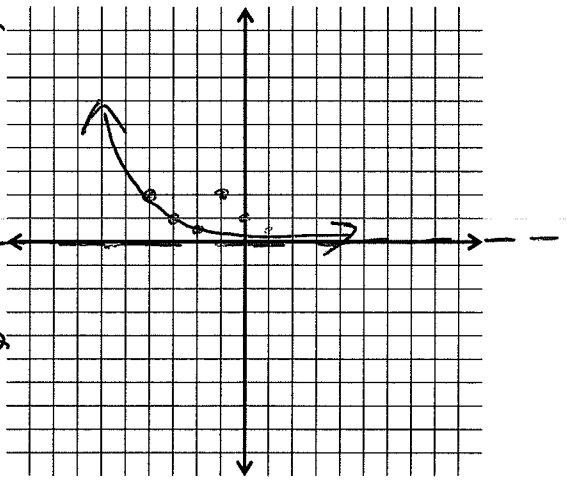
$= 2^{-1} + 3$

$= \frac{1}{2} + 3 = 3.5$

7) $y = \left(\frac{1}{2}\right)^{x+3}$

parent $\rightarrow y = \left(\frac{1}{2}\right)^x$

x	y
-1	2
0	1
1	1/2



Describe the shift: left 3

Asymptote: $y=0$

Domain: $(-\infty, \infty)$ Range: $(0, \infty)$

x-intercept: none y-intercept: $(0, \frac{1}{8})$

Growth or Decay?

$y = \left(\frac{1}{2}\right)^{0+3}$

$= \left(\frac{1}{2}\right)^3$ $\leftarrow \left(\frac{1}{2}\right)\left(\frac{1}{2}\right)\left(\frac{1}{2}\right) = \frac{1}{8}$

$= \frac{1}{8}$

Reminders: 1. rates must be written as decimals
2. don't forget units!

problems on INTEREST

THE FOLLOWING WILL BE CALCULATOR

$y = a(1+r)^t$ $y = a(1-r)^t$ $A = P\left(1+\frac{r}{n}\right)^{nt}$ $A = Pe^{rt}$

8.) Hillside secondary school had an enrollment of 1,400 in 2001. The enrollment is expected to increase at a rate of 4% per year.

a. Write an exponential function to model the situation.

$y = 1400(1+.04)^t$ or $y = 1400(1.04)^t$

b. Calculate the estimated school enrollment in 2006.

2006 − 2001 = 5

$y = 1400(1.04)^5 = 1703.3 \approx$ 1704 students

9.) In the year 2004 it was estimated that the Amazon rain forest was home to 60,000 poison arrow frogs. Due to loss of habitat the number of frogs is falling at a rate of 15% per year.

a. Write an exponential function to model the situation.

$y = 60{,}000(1-.15)^t$ or $y = 60000(.85)^t$

b. Calculate the estimated number of frogs for 2008.

2008 − 2004 = 4 years

$y = 60000(.85)^4 = 31320.38 \approx$ 31,321 frogs

10.) Suppose your goal is to have at least $3,000 in a bank account after 5 years. Which account will allow you to reach your goal if you have $2,500 to deposit? Identify all accounts that qualify.

Bank	Interest Rate	Compounding
X	3.5%	Monthly
Y	4.0%	Yearly
Z	4.7%	Quarterly

Bank X

$A = 2500\left(1+\frac{.035}{12}\right)^{12 \cdot 5}$

$= \$2{,}977.36$

Bank Y

$A = 2500\left(1+\frac{.04}{1}\right)^{1 \cdot 5}$

$= \$3{,}041.63$

Bank Z

$A = 2500\left(1+\frac{.047}{4}\right)^{4 \cdot 5}$

$= \$3{,}157.94$

11.) You deposit $600 in an account that pays 1% annual interest compounded continuously, find the balance for 5 years.

$A = Pe^{rt}$ $A = 600e^{.01(5)} = \boxed{\$630.79}$

12.) You started working at a new company in 2010 and the company raises your salary each year. Your salary S (in thousands of dollars) can be modeled by $\boxed{S = 38(1.04)^t}$ where t is the number of years since you started working.

a. What can you expect your salary to be in 2015?

2015 − 2010 = 5

$S = 38(1.04)^5 = 46.2328 \rightarrow \boxed{\$46,232.81}$

b. What is your initial salary? What is the growth rate for your salary?

after zero yrs ↓ $\boxed{\$38,000}$

$1 + .04$ ↓ $\boxed{4\%}$

Solve for x in each of the following.

13.) $6^3 = 6^{2x+5}$

$3 = 2x + 5$

$-5 \quad -5$

$\frac{-2}{2} = \frac{2x}{2}$

$\boxed{x = -1}$

14.) $10^{4x-5} + 11 = 20$

$-11 \quad -11$

$10^{4x-5} = 9$

$\log_{10} 9 = 4x - 5$

$.954 = 4x - 5$

$+5 \quad +5$

$\frac{5.954}{4} = \frac{4x}{4}$

$\boxed{x = 1.489}$

15.) $\log_5(3x + 5) = \log_5(x - 9)$

$3x + 5 = x - 9$

$-x \quad -5 \quad -x \quad -5$

$\frac{2x}{2} = \frac{-14}{2}$

$\boxed{x = -7}$

$\boxed{\text{no solution}}$

you cannot take the log of a negative

16.) $\log_5(4x + 25) + 7 = 10$

$-7 \quad -7$

$\log_5(4x + 25) = 3$

$5^3 = 4x + 25$

$125 = 4x + 25$

$-25 \quad -25$

$\frac{100}{4} = \frac{4x}{4}$

$\boxed{x = 25}$