Chapter 4 review

This is NOT intended to be comprehensive!

1) State the domain of each of the following functions.
   a) $y = e^x$
   b) $y = \log x$

2) Fill in the following table:

Function	Base, b	y-intercept	Growth or decay?	Growth or decay rate
$y = 2(1.08)^x$	1.08	(0, 2)	Growth	8%
$y = 6(0.87)^x$	0.87	(0, 6)	decay	-13%
$y = 3e^{-0.07x}$	e	(0, 3)	decay	7%
$23(1.12)^x$	1.12	(0, 23)	Growth	12%

3) Find an equation for an exponential passing through the points (-2, 5) and (3, 160)

4) According to one source, in 1984 there were approximately 1500 AIDS cases in California. By 1986 there were 4000 cases. Uncontrolled, a virus tends to spread exponentially. Assuming the virus were to spread uncontrolled,
   a) Write an equation for the number of AIDS cases t years after 1984.

   b) Describe your equation in words

   c) According to your model, how many people would have been infected in California in 2001?

5) A population can be described by $P(t) = 200(1.05)^t$. What is the doubling time for this population?

6) Solve each of the equations below for x using algebra and properties of logarithms and exponents. Show all steps!

   a) $4(1.7)^x = 7(1.08)^x$

   b) $3e^{x+5} = 7$

   c) $\log(x + 3) = 3$

   d) $\log(x - 1) + \log(x + 1) = 2$

7) A population doubles every 8 years. Assuming exponential growth, find the
   a) Continuous growth rate
   b) Annual growth rate

(1) (a) all reals

(b) $(0, \infty)$

(3) $(-2, 5)\ (3, 160)$

$5 = ab^{-2}$

$\frac{5}{1} = \frac{a}{b^2}$

$a = 5b^2$

$160 = 5b^2b^3$

$160 = 5b^5$

$32 = b^5$

$2 = b$

$a = 5(2)^2$

$a = 20$

$y = 20(2)^x$

(4) $(0, 1500)\ (2, 4000)$

$4000 = 1500b^2$

$b^2 = \frac{8}{3}$ $\quad b = \sqrt{\frac{8}{3}}$

(a) $y = 1500(1.633)^x$

(b) The # of cases are increasing at a 63.3% annual rate.

(c) $T = 7 \quad 1500(1.633)^7 \quad 46,449$ cases

(5) $P(T) = 200(1.05)^T$

$2 = 1.05^T$ $\quad \log_{1.05}(2) = \frac{\log 2}{\log 1.05}$

14.207 years

(6) $4(1.7)^x = 7(1.08)^x$

$\left(\frac{1.7}{1.08}\right)^x = \frac{7}{4}$

(a) $1.574^x = 1.75$ $\quad \frac{\log 1.75}{\log 1.574} = x$

x = 1.234

(b) ~~2~~ $3e^{x+5} = 7 \rightarrow e^{x+5} = \frac{7}{3}$

$x + 5 = \ln\left(\frac{7}{3}\right)$

x = −4.153

(c) $\log_2(x+3) = 3$ $\quad 10^3 = x+3$

$1000 - 3 = x$

997 = x

(6)(d) $\log(x-1)+\log(x+1)=2$

$\log(x-1)(x+1)=2 \rightarrow 10^2=(x-1)(x+1)$

$x^2-1=100$

$x^2=99$ $\boxed{x=9.95}$

(7) $2=b^8$ $b=\sqrt[8]{2}$

$b=1.091 \rightarrow$ 9.1% annual

$\ln(1.091) \rightarrow$ 8.7% continuously

.087

(8) Alex $4000\left(1+\frac{.06}{12}\right)^{12T}$ Shanm $2000\left(1+\frac{.09}{4}\right)^{4T}$

$4000(1.005)^{12T}=2000(1.023)^{4T}$

$2=\left(\frac{1.023^4}{1.005^{12}}\right)^T$

$2=1.032^T$ $\log_{1.032}2=T$

$\boxed{T=22.28}$ years

(9) $\frac{1}{2} = b^{300}$ $\sqrt[300]{.5} = b$

$b = .9977$

$1 - .9977$ (0.23% annual)

$e^k = .9977$ .231% essentially 1k sum

(10) $\log x^2 + \log 2^3$

$\log \frac{x^2}{8}$

(11) $y = ab^x + 2$ (0,-1) (1,-2)

$-1 = ab^0 + 2$

$-3 = a$

$-2 = -3b^1 + 2$

$b = 2$

$y = -3(2)^x + 2$

(12) Dis Inv

A & E are exponential

C is Logarithm

B is Quadratic