Graph Exponential Growth Functions (1)
Section 7.1 Notes
Algebra 2

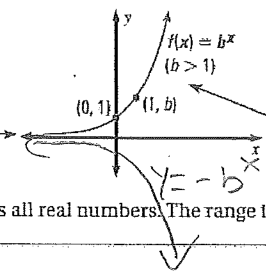
Name KEY 2015-16
Hour______ Date______________

KEY CONCEPT *For Your Notebook*

Parent Function for Exponential Growth Functions

The function $f(x) = b^x$, where $b > 1$, is the parent function for the family of exponential growth functions with base b. The general shape of the graph of $f(x) = b^x$ is shown below.

The x-axis is an asymptote of the graph. An asymptote is a line that a graph approaches more and more closely.



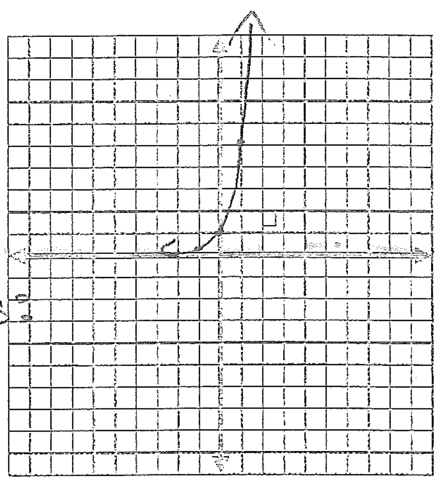
The graph rises from left to right, passing through the points (0, 1) and (1, b).

The domain of $f(x) = b^x$ is all real numbers. The range is $y > 0$.

Exponential Functions:
$Y = a(b)^x$

Expn. Growth Functions:
- $b > 1$
- Have a horizontal asymptote
- move away from the x-axis as x-values increase.

Example 1 – Graph $y = 5^x$.



X	Y
-2	$5^{-2} = \frac{1}{5^2} = \frac{1}{25} = .04$
-1	$5^{-1} = \frac{1}{5} = .2$
0	$5^0 = 1$
1	$5^1 = 5$
2	$5^2 = 25$

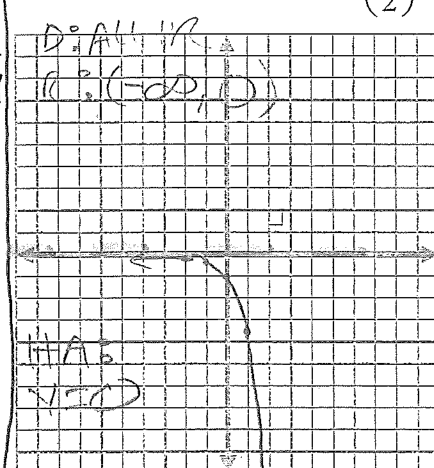
HA is: $Y = 0$

D: All Reals R: $(0, \infty)$

Example 2 – Graph $y = -\left(\frac{7}{2}\right)^x = -(3.5)^x$

D: All IR
R: $(-\infty, 0)$

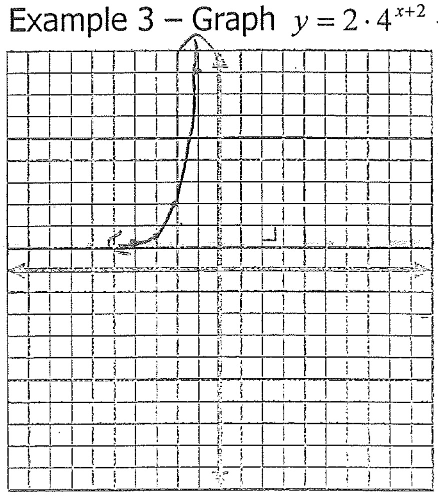
HA is: $Y = 0$



Let's make predictions
- Growth fn' ($b > 1$)
- Flipped over X-axis
- Not as fast of growth as ex 1. $3.5 < 5$

X	-2	-1	0	1	2
Y	-.08	-.29	-1	-3.5	-12.25

Example 3 – Graph $y = 2 \cdot 4^{x+2} + 1$. State the domain and range.



- Growth or decay? why?
  Growth $b > 1$ $(b = 4)$
- Flipped or not flipped? why?
  Not flipped +2 in front
- what does $x+2$ do to the graph?
  Graph shifts left 2.
- what does $+1$ do to the graph?
  Graph shifts up 1. HA: $Y = 1$

X	-4	-3	-2	-1	0
Y	1.125	1.5	3	9	33

GC ↗

D: All IR or $(-\infty, \infty)$
R: $(1, \infty)$

Exponential form $\to Y = a(b)^x$ a - initial amount $b = \left(\frac{100 + \%\text{ Growth}}{100}\right)$

Example 4 – In 1970, the population of Kern County, California, where Bakersfield is located, was about 330,000. From 1970 to 2000, the county population grew at an average annual rate of about 2.4%. $a = 330{,}000$ $b = \left(\frac{100 + 2.4}{100}\right)$

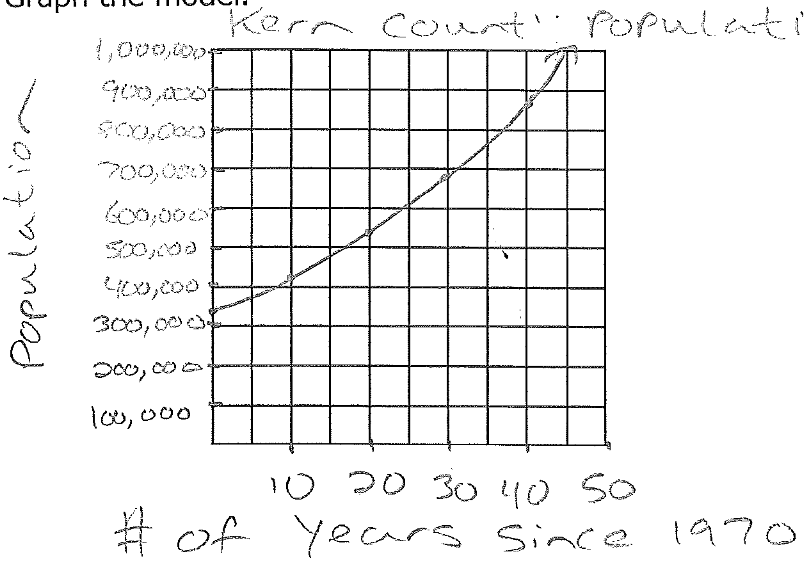
a. Write an exponential growth model giving the population P of Kern County in 1990?

$Y = 330{,}000(1.024)^x$

b. About how many people lived in Kern County in 1990?

$Y = 330{,}000(1.024)^{20} \approx 530{,}290$ people

c. Graph the model.



check pop. in 2020

$Y = 330{,}000(1.024)^{50}$

$= 1{,}0892{,}2$

KEY CONCEPT *For Your Notebook*

Compound Interest

Consider an initial principal P deposited in an account that pays interest at an annual rate r (expressed as a decimal), compounded n times per year. The amount A in the account after t years is given by this equation:

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

Example 5 – You deposit \$5,500 in an account that pays 3.6% annual interest. Find the balance after 2 years if interest is compounded with the given frequency.

a. semiannually (2 times)

$A = 5{,}500\left(1 + \frac{0.036}{2}\right)^{2 \cdot 2} = \$5{,}906.82$

b. monthly (12 times)

$A = 5{,}500\left(1 + \frac{0.036}{12}\right)^{12 \cdot 2}$

$= \$5{,}909.97$

You will make a little more \$ in an account that compounds interest more frequently.

Assignment – P. 482-484 #1-27 odd, 28-30, 35-38.

section 7.1 HW

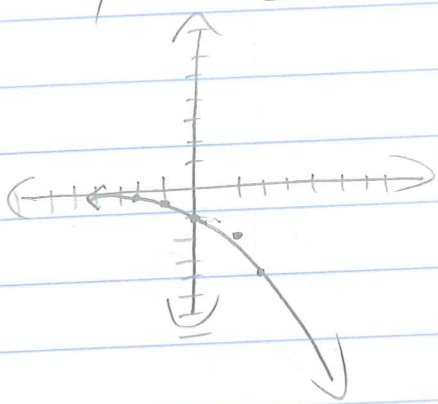
p. 482-484

1. Initial - 2.4
   Growth - 1.5
   % Increase - 50%

3. C

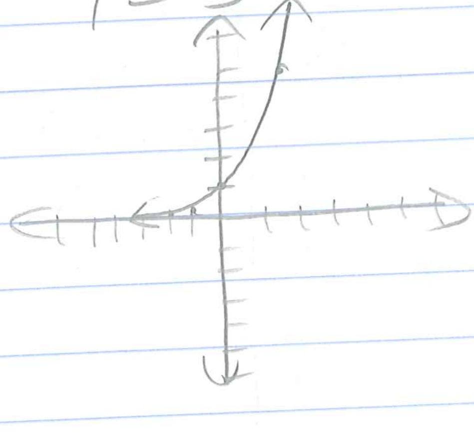
5. B

7. $Y = -2^x$



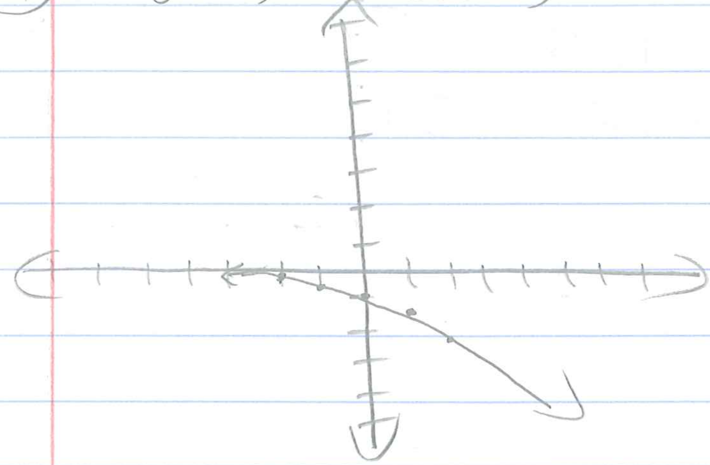
X	Y
-2	-0.25
-1	-0.5
0	-1
1	-2
2	-4

9. $Y = 5^x$



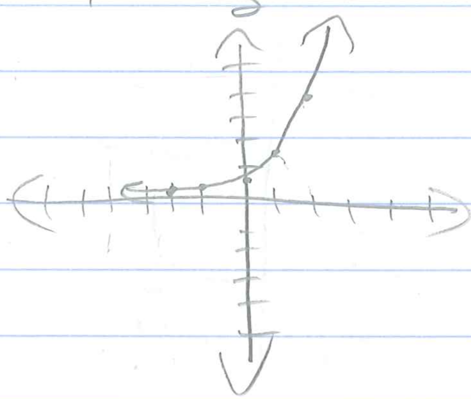
X	Y
-2	.04
-1	.2
0	1
1	5
2	25

(11) $g(x) = -(1.5)^x$



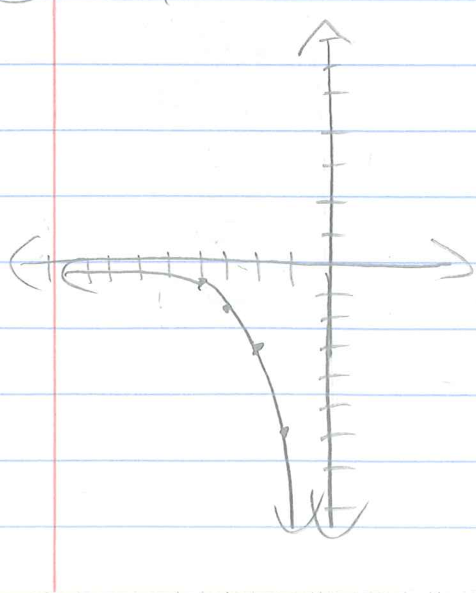
X	Y
-2	$-.\overline{4}$
-1	$-.\overline{6}$
0	-1
1	-1.5
2	-2.25

(13) $Y = \frac{1}{2} \cdot 3^x$



X	Y
-2	.05
-1	.17
0	$\frac{1}{2}$
1	1.5
2	4.5

(15) $Y = -3 \cdot 2^{x+2}$

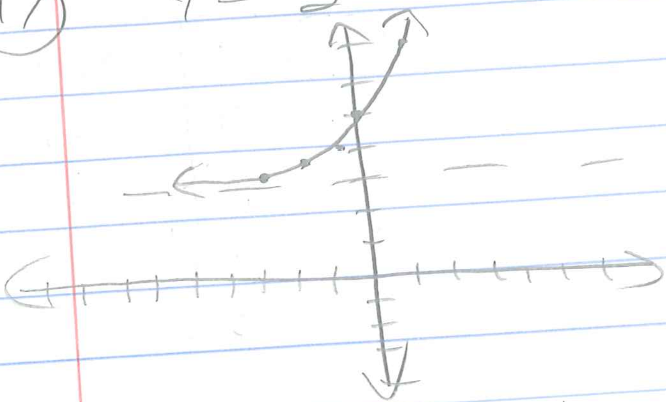


X	Y
-4	-.75
-3	-1.5
-2	-3
-1	-6
0	-12

D: $(-\infty, \infty)$

R: $(-\infty, 0)$

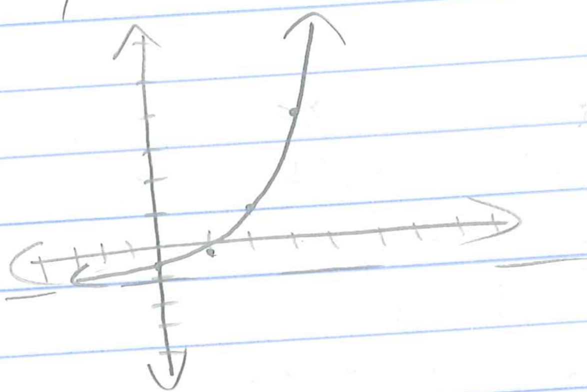
(17) $y = 2^{x+1} + 3$



X	Y
-3	3.25
-2	3.5
-1	4
0	5
1	7

D: $(-\infty, \infty)$
R: $(3, \infty)$

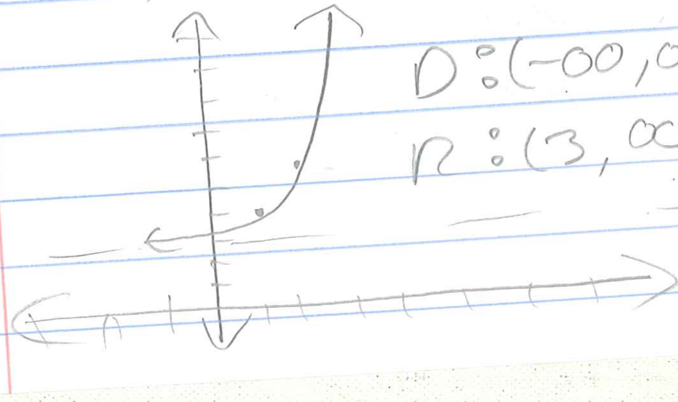
(19) $y = 2 \cdot 3^{x-2} - 1$



X	Y
0	$-.78$
1	$-.\overline{3}$
2	1
3	5
4	17

D: $(-\infty, \infty)$
R: $(-1, \infty)$

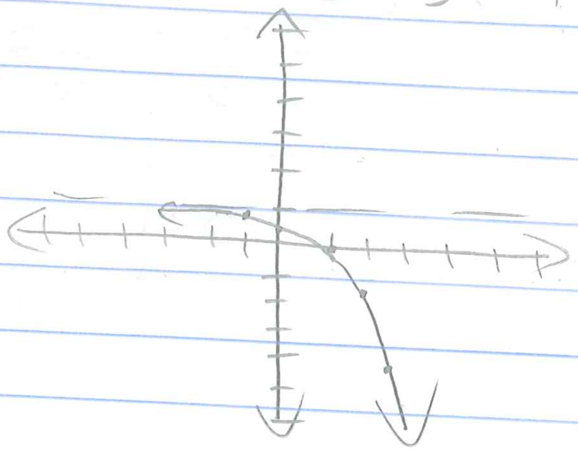
(21) $f(x) = 6 \cdot 2^{x-3} + 3$



D: $(-\infty, \infty)$
R: $(3, \infty)$

X	Y
1	4.5
2	6
3	9
4	15
5	27

(23) $h(x) = -2.5^{x-1} + 1$



x	y
-1	.84
0	.6
1	0
2	-1.5
3	-5.25

D: $(-\infty, \infty)$ R: $(-\infty, 1]$

(25) D.

(27) Should have been shifted right 3, not left 3.

(28) $y = 1219(1.12)^t$

t - # of years after 92'

y - # of monk parakeets

(29) $A = 800\left(1 + \frac{0.02}{365}\right)^{365t}$

(30) $y = 450(1.06)^t$

t - # of years later

y - value of table.

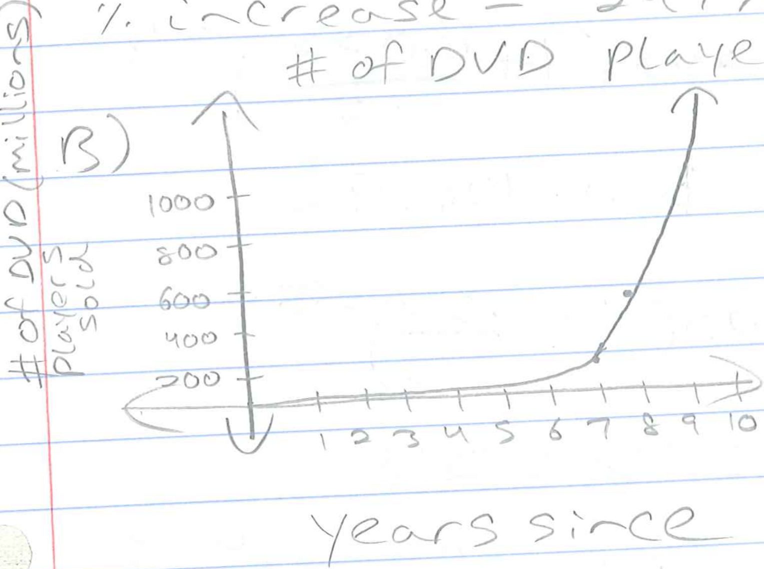
(35) A) $n = 0.42(2.47)^t$

initial amt - 0.42 million

Growth Factor - 2.47

% increase - 247% - 100% = 147%

B)



$t = 4$

$n = 0.42(2.47)^4$

$n = 15.63$ million

≈ 16 million

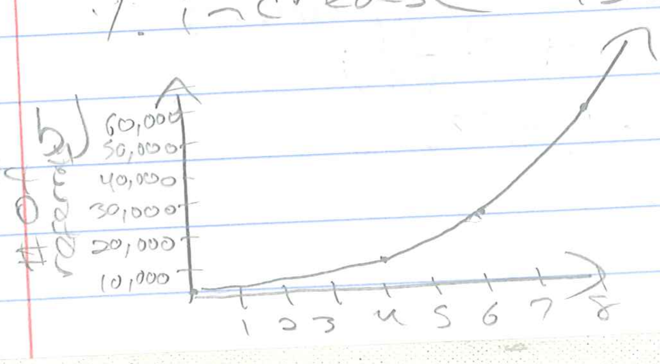
(36) a) $Y = 2500(1.50)^t$

Initial - 2500

Growth - 1.50

% increase - 150% - 100% = 50%

b)



D: $[0, \infty)$

R: $[2500, \infty)$

$\approx$ 13,000 referrals

years later

37) A) $A = 2200\left(1+\frac{.03}{4}\right)^{4\cdot 4}$

$= \$2,479.38$

B) $A = 2200\left(1+\frac{0.0225}{12}\right)^{12\cdot 4}$

$= \$2,406.98$

C) $A = 2200\left(1+\frac{.02}{365}\right)^{365\cdot 4}$

$= \$2,383.23$

38) a) $3000 = x\left(1+\frac{.0225}{4}\right)^{4\cdot 3}$

$3000 = x \cdot 1.069...$

$\$2,804.71 = x$

b) $3000 = x\left(1+\frac{.035}{12}\right)^{12\cdot 3}$

$3000 = x \cdot 1.11...$

$\$2,701.39 = x$

c) $3000 = x\left(1+\frac{0.04}{365}\right)^{365\cdot 3}$

$3000 = x \cdot 1.27...$

$\$2,660.78 = x$