Name: KEY Hour: ______ Date: ______

NOTES: Section 8.6 – Exponential Growth Functions

Goals: #1 - I can graph write and graph exponential growth functions.

Homework: Section 8.6 Worksheet

Warm Up:

1. Write the number 0.000459 in scientific notation.

$\boxed{4.59 \times 10^{-4}}$

2. Write the number 4.33×10^{8} in standard notation.

4.33000000

$\boxed{433{,}000{,}000}$

3. Perform the indicated operation.

a. $(9 \times 10^{-6})(2 \times 10^{4})$

18×10^{-2}

$\boxed{1.8 \times 10^{-1}}$

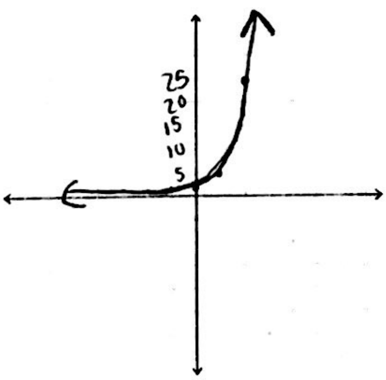
b. $\frac{8 \times 10^{-3}}{4 \times 10^{-5}}$ $\frac{8}{4} \times 10^{-3-(-5)}$

$\boxed{2 \times 10^{2}}$

Exploration #1: Work with a partner. Complete the tables and graph the following functions.

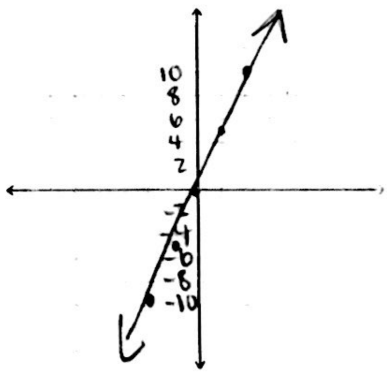
1. $y = 5^x$

x	y
-2	$\frac{1}{25}$
-1	$\frac{1}{5}$
0	1
1	5
2	25



2. $y = 5x$

x	y
-2	-10
-1	-5
0	0
1	5
2	10



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Notes:

One use of exponential functions is to model exponential growth.

A quantity is growing exponetially if it increse by the same percent in each unit of time. rate of 10%, triples

Exponential growth can be modeld by the equation:

$$y = \underbrace{C}_{\text{initial amount}}\underbrace{(1 + \underbrace{r}_{\text{growth rate}})}_{\text{growth factor}}^{t \to \text{time}}$$

Example #1: A newly hatched channel catfish typically weighs about 0.06 gram. During the first six weeks of life, its weight increases by about 10% each day. Write a model for the weight of the catfish during the first six weeks.

Let y = weight of the catfish (grams)

t = time (days)

$y = C(1+r)^t$

$C = 0.06$

$r = 10\%$

$y = 0.06(1+.10)^t$

$\boxed{y = 0.06(1.1)^t}$

a. Using the model, predict the weight of the catfish after 26 days.

$y = 0.06(1.1)^{26}$

$y \approx \boxed{0.72 \text{ grams}}$

Example #2: A TV station's local news program has 50,000 viewers. The managers of the station hope to increase the number of viewers by 2% per month. Write an exponential growth model to represent the number of viewers v in t months.

Let V = # of viewers

t = time (months)

$V = C(1+r)^t$

$C = 50{,}000$

$r = 2\%$

$V = 50{,}000(1+0.02)^t$

$\boxed{V = 50{,}000(1.02)^t}$

a. Using the model, predict how many viewers the news program will have in 15 months.

$V = 50{,}000(1.02)^{15}$

$V \approx \boxed{67{,}293 \text{ viewers}}$

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Notes:

A common real-life example of exponential growth is compound interest.

The model for compound interest is generally written using:

account balance ← $A = P(1 + r)^{t}$ → time (years)

principal (amt paid)   interest rate

Example #3: You deposit $500 in an account that pays 8% interest compounded yearly. What will the account balance be after 6 years?

$A = P(1+r)^t$

$P = 500$
$r = 8\%$
$t = 6$
$A = ?$

$A = 500(1+0.08)^6$
$A = 500(1.08)^6$
$\boxed{A \approx \$793}$

Example #4: A savings certificate of $1000 pays 6.5% interest compounded yearly. What is the balance when the certificate matures in 5 years?

$A = P(1+r)^t$

$P = 1000$
$r = 6.5\%$
$t = 5$
$A = ?$

$A = 1000(1+0.065)^5$
$A = 1000(1.065)^5$
$\boxed{A \approx \$1370.09}$

You practice:

1. A rancher begins his herd of Longhorn cattle with 15. The herd grows by about 30% per year. Write a model for the size of his during the first several years. Let y = # of cattle, t = time (years)

$y = C(1+r)^t$
$C = 15$
$r = 30\%$

$y = 15(1+0.30)^t$
$\boxed{y = 15(1.3)^t}$

a. Using the model, predict how many cattle the rancher will have in 4 years.

$y = 15(1.3)^4$
$y = \boxed{43 \text{ cattle}}$

2. You deposit $750 in an account that pays 6% interest rate compounded yearly. What is the balance after 10 years?

$A = (1+r)^t$

$P = 750$
$r = 6\%$
$t = 10$
$A = ?$

$A = 750(1+0.06)^{10}$
$A = 750(1.06)^{10}$
$A = \boxed{\$1343.14}$

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growth factor!

Example #5: An initial population of 20 mice triples each year for 5 years.

a. Write an exponential growth model.

y = # of mice
t = time (years)

$y = C(1+r)^t$

$\boxed{y = 20(3)^t}$

b. What is the mice population after 3 years?

$y = 20(3)^3$

$y = \boxed{540 \text{ mice}}$

c. What is the mice population after 5 years?

$y = 20(3)^5$

$y = \boxed{4860 \text{ mice}}$

d. Graph the exponential growth of the model using a table:

t	*y*
0	20
1	60
3	540
4	1620
5	4860

$20(3)^1$

$20(3)^4$