NAME: _____ PERIOD: _____ DATE: _____

Homework Problem Set

For each table in Problems 1–6, classify the data as describing a linear or exponential relationship or neither. If the relationship is linear or exponential, write a formula for the function that models the data. Then graph the data and connect the data points.

1.

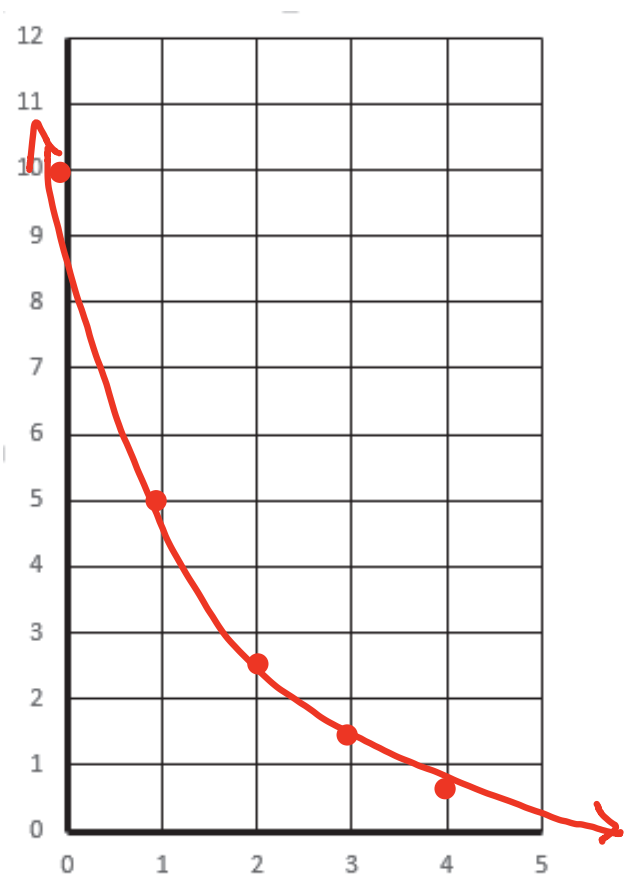
x	*f*(*x*)
0	10
1	5
2	2.5
3	1.25
4	0.625
5	0.3125

× $\frac{1}{2}$
× $\frac{1}{2}$

Linear, Exponential or Neither?

Equation, if linear or exponential:

$f(x) = 10(\frac{1}{2})^x$



2.

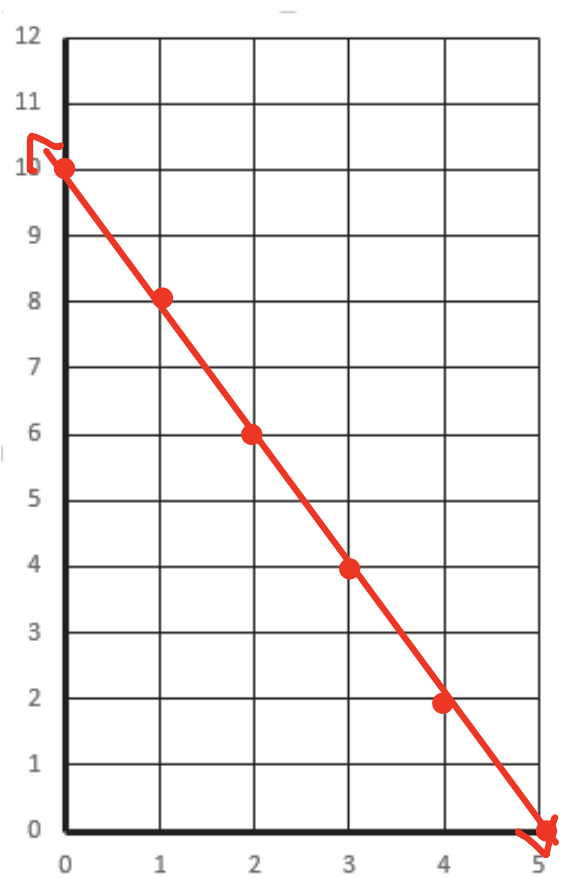
x	*f*(*x*)
0	10
1	8
2	6
3	4
4	2
5	0

-2
-2

Linear, Exponential or Neither?

Equation, if linear or exponential:

$f(x) = -2x + 10$



3.

x	$f(x)$
0	2
1	3
2	4
3	5
4	6
5	7

+1, +1, +1

Linear, Exponential or Neither?

Equation, if linear or exponential:

$f(x) = x + 2$

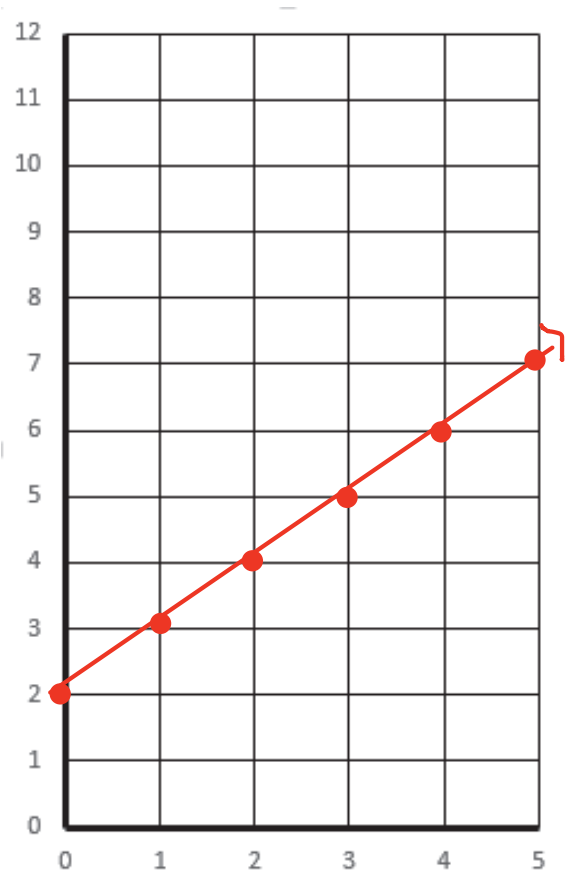
4.

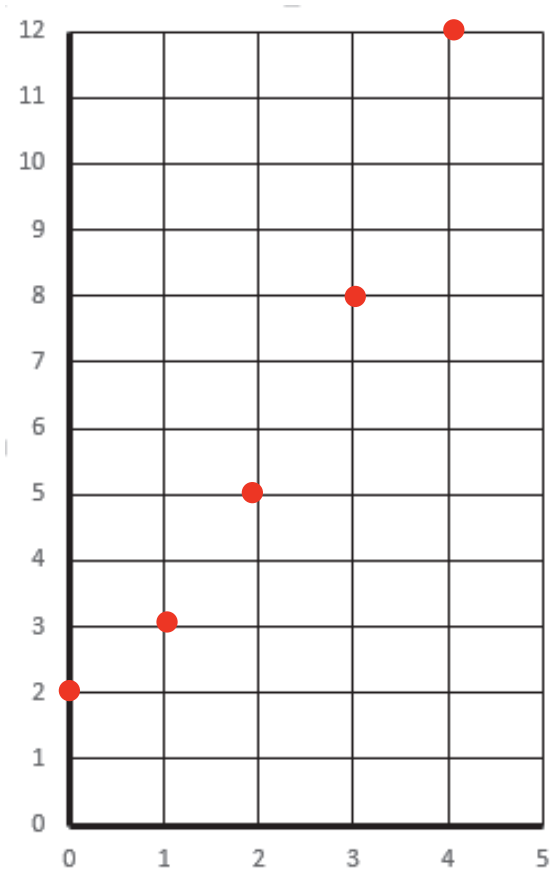
x	$f(x)$
0	2
1	3
2	5
3	8
4	12
5	17

+1, +2, +3, +4

Linear, Exponential or Neither?

Equation, if linear or exponential:





5.

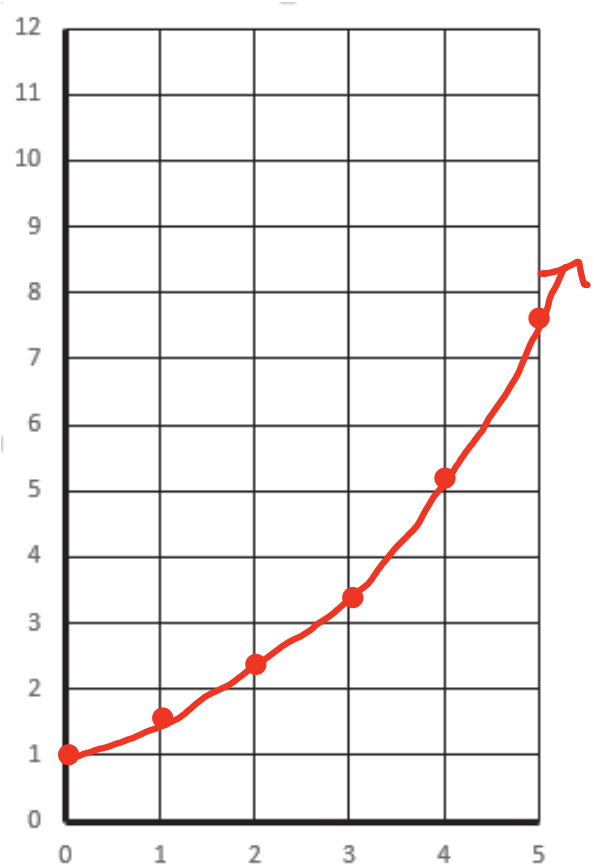
x	$f(x)$
0	1
1	1.5
2	2.25
3	3.375
4	5.0625
5	7.59375

x1.5
x 1.5
x 1.5

Linear, Exponential or Neither?

Equation, if linear or exponential:

$f(x) = 1(1.5)^x$



6. Here is a variation on a classic riddle: Jayden has a dog-walking business. He has two plans. Plan 1 includes walking a dog once a day for a rate of $5 per day. Plan 2 also includes one walk a day but charges 1 cent for 1 day, 2 cents for 2 days, 4 cents for 3 days, and 8 cents for 4 days and continues to double for each additional day. Mrs. Maroney needs Jayden to walk her dog every day for two weeks. Which plan should she choose? Show the work to justify your answer.

© Thomas Nord/Shutterstock.com

PLAN 1:

$5 \times 14 = 70$

$70 for 2 weeks

PLAN 2

.01, .02, .04, .08

$f(x) = .01(2)^{x-1}$

$f(14) = .01(2)^{13}$

$f(14) = \$81.92$

* PLAN 1 is better choice for Mrs. Maroney

7. Tim deposits money in a certificate of deposit account. The balance (in dollars) in his account t years after making the deposit is given by $T(t) = 1000(1.06)^t$ for $t \geq 0$.


© maxsattana/Shutterstock.com

A. Explain, in terms of the structure of the expression used to define $T(t)$, why Tim's balance can never be \$999.

This is a growth model. Initial investment is $1000 and it will never go below this amount.

B. By what percent does the value of $T(t)$ grow each year? Explain by writing a recursive formula for the sequence $T(1)$, $T(2)$, $T(3)$, etc.

year 1: $1000(1.06)^1$
year 2: $1000(1.06)^2$
year 3 $1000(1.06)^3$

$T(n+1) = T(n)(1.06)$ or $T(n+1) = T(n) + T(n)(1.06)$ shows that it grows by 6%

C. By what percentages does the value of $T(t)$ grow every two years? (Hint: Use your recursive formula to write $T(n + 2)$ in terms of $T(n)$.)

Since $T(n+1) = T(n)(1.06)$ we can write $T(n+2) = T(n+1)(1.06) = T(n)(1.06)(1.06)$ or $T(n+2) = T(n)(1.1236)$

* His acct grows by 12.36% every 2 years

8. A river has an initial minnow population of 40,000 that is growing at 5% per year. Due to environmental conditions, the amount of algae that minnows use for food is decreasing, supporting 1,000 fewer minnows each year. Currently, there is enough algae to support 50,000 minnows.


© Rostislav Stefanek/Shutterstock.com

A. Is the minnow population increasing linearly or exponentially?

increasing exponentially

B. Is the amount of algae decreasing at a linear or an exponential rate?

decreasing linearly

C. In what year will the minnow population exceed the amount of algae available?

$40{,}000(1.05)^n > 50{,}000 - 1000n$

$n = 3$ yrs
$46{,}300 > 47{,}000$
False

$n = 4$ years
$48{,}600 > 46{,}000$
TRUE

* Between 3 and 4 years

Spiral REVIEW—Looking for Patterns

Determine a pattern that could be used to get from the first term to the last term in each sequence.

10.

Term Number	1	2	3	4
Term	10	20	30	40

Pattern description: multiply term # by 10 to get term OR add 10 to term to get next term

$10n$

11.

Term Number	1	2	3	4
Term	10	20	40	80

Pattern description: multiply each term by 2 to get next term OR

$10(2)^{n-1}$

12.

Term Number	1	2	3	4
Term	10	30	90	270

Pattern description: multiply each term by 3 to get next term OR

$10(3)^{n-1}$

13.

Term Number	1	2	3	4
Term	10	7	4	1

Pattern description: Subtract 3 from previous term to get next term. OR

$13-3n$

9. **Challenge** Your mathematics teacher asks you to sketch a graph of the exponential function $f(x) = \left(\frac{3}{2}\right)^x$ for x, a number between 0 and 40 inclusively, using a scale of 10 units to one inch for both the x- and y-axes.

   A. What are the dimensions (in feet) of the roll of paper needed to sketch this graph?

   B. How many more feet of paper would you need to add to the roll in order to graph the function on the interval $0 \leq x \leq 41$?

   C. Find an m so that the linear function $g(x) = mx + 2$ is greater than $f(x)$ for all x such that $0 \leq x \leq 40$, but $f(41) > g(41)$.