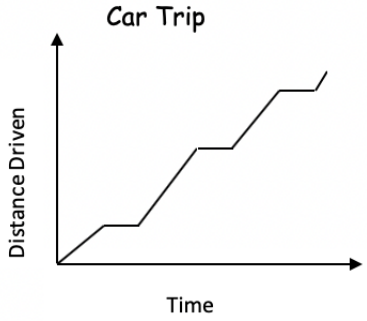
Name:_____ Date:_____

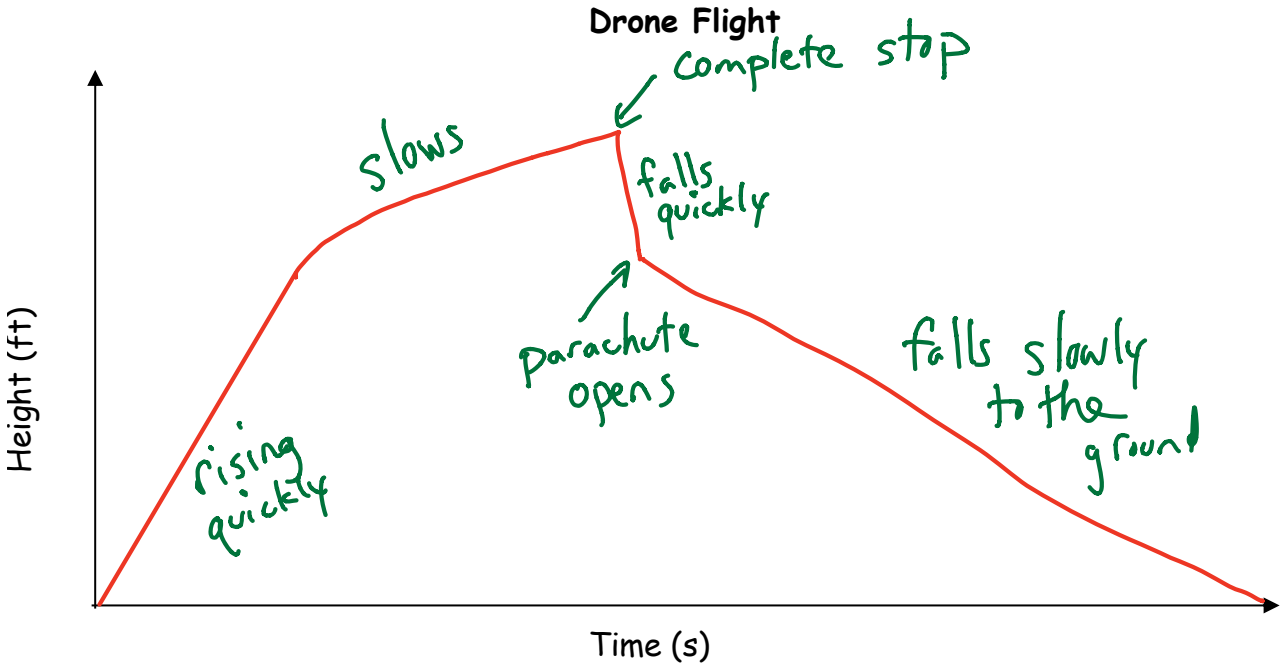
Notes: Analyzing Graphs

Do Now: State the independent variable and the dependent variable. Then, describe how the variables are related throughout the graph.



Independent Variable: Time Dependent Variable: Distance Driven
As time increase, distance driven increases except when the drive stops for a little bit (when the slope is 0).

A drone rises quickly into the air and then slows as its battery runs out, until it reaches a complete stop. The drone then falls quickly until a parachute opens, after which it falls slowly back to the ground. Sketch a graph that could represent this situation. Label each section of the graph.



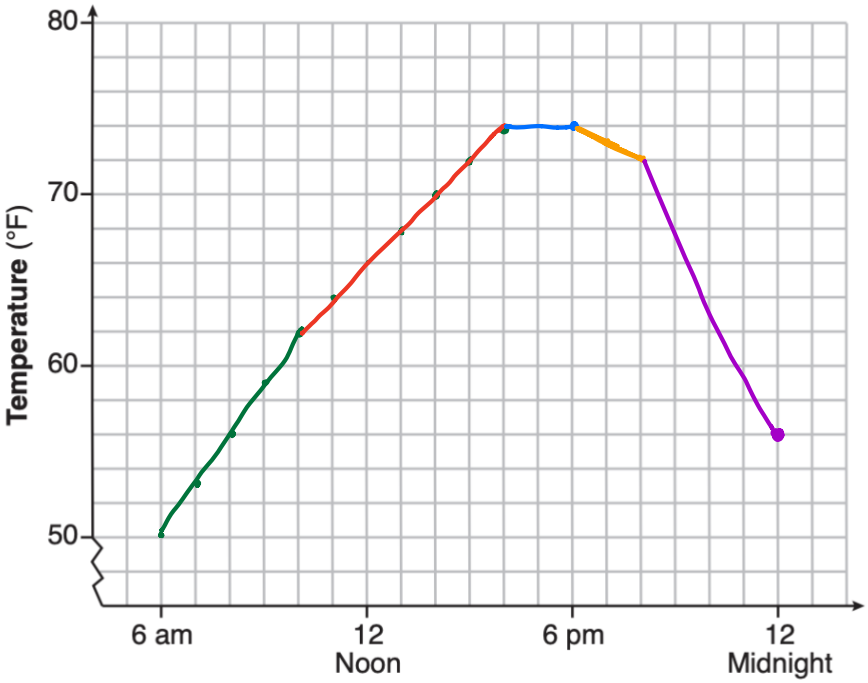
What Should I Be Able to Do?

- **I can interpret a graph's meaning in a real-world context.**
- **I can represent a real-world situation between two variables graphically.**
- **I can determine whether a relation is linear or nonlinear.**
- **I can graph absolute value equations.**

One spring day, Elroy noted the time of day and the temperature, in degrees Fahrenheit. His findings are stated below.

At 6 a.m., the temperature was 50°F. For the next 4 hours, the temperature rose 3° per hour.
The next 6 hours, it rose 2° per hour.
The temperature then stayed steady until 6 p.m.
For the next 2 hours, the temperature dropped 1° per hour.
The temperature then dropped steadily until the temperature was 56°F at midnight.

On the set of axes below, graph Elroy's data.



State the entire time interval for which the temperature was increasing.

From 6 am to 4 pm

Determine the average rate of change, in degrees per hour, from 6:00 p.m. to midnight.

$m = \frac{\Delta y}{\Delta x} = \frac{-18}{6} =$ **-3 °F per hour**

Notes: Linear vs Nonlinear Relations

Do Now: What makes a relationship between two variables linear?

It has a constant rate of change

What make a relationship between two variables nonlinear?

It does not have a constant rate of change.

Rachel and Marc were given the information shown below about the bacteria growing in a Petri dish in their biology class.

+1 +1

Number of Hours, x	1	2	3	4	5	6	7	8	9	10
Number of Bacteria, B(x)	220	280	350	440	550	690	860	1070	1340	1680

+60 +70

Rachel wants to model this information with a linear function. Marc wants to use an exponential function. Which model is the better choice? Explain why you chose this model.

Marc is correct because the information does not have a constant rate of change.

Which equation represents a linear function?

$y = mx + b$

~~A~~ $y = \frac{4}{x} + 1$

~~B~~ $y = x^2 + 2$

~~C~~ $y = \sqrt[3]{x + 1}$

(D) $y = -\frac{2}{3}x - \frac{1}{2}$

Which situation can be modeled by a linear function?

day. 1 2 3
pop. 4 8 16

(1) The population of bacteria triples every day. →

(2) The value of a cell phone depreciates at a rate of 3.5% each year.

(3) An amusement park allows 50 people to enter every 30 minutes.

never constant
constant rate of change

(4) A baseball tournament eliminates half of the teams after each round.

round 1 2 3 4
teams 64 32 16 8

One characteristic of all linear functions is that they change by

(1) equal factors over equal intervals →

x	1	2	3	4
y	2	4	8	16

(2) unequal factors over equal intervals

(3) equal differences over equal intervals →

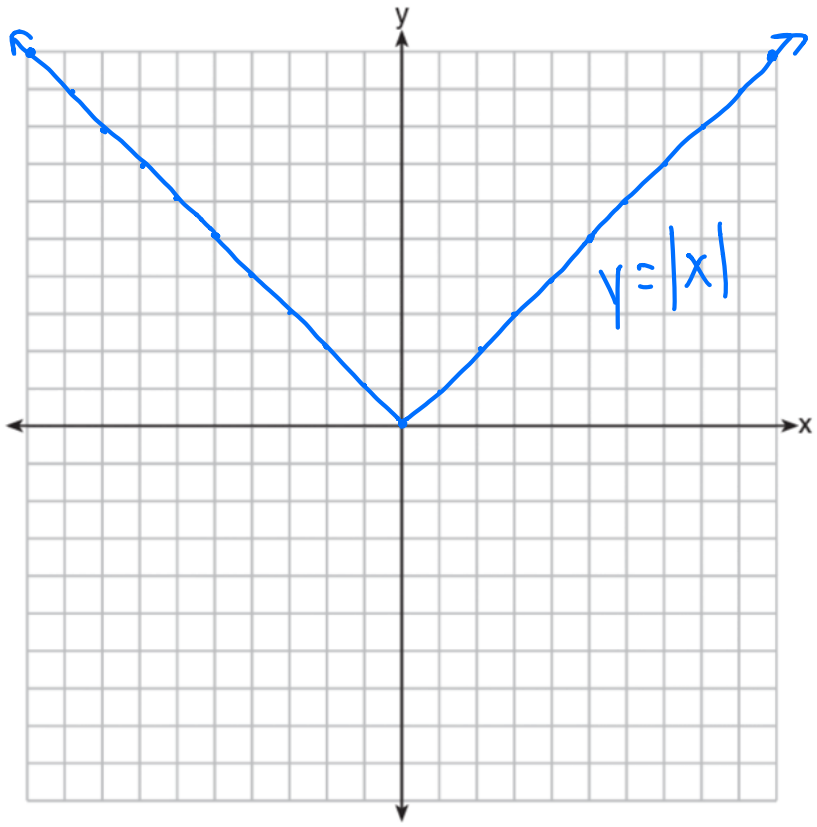
x	1	2	3	4
y	2	4	6	8

(4) unequal differences over equal intervals

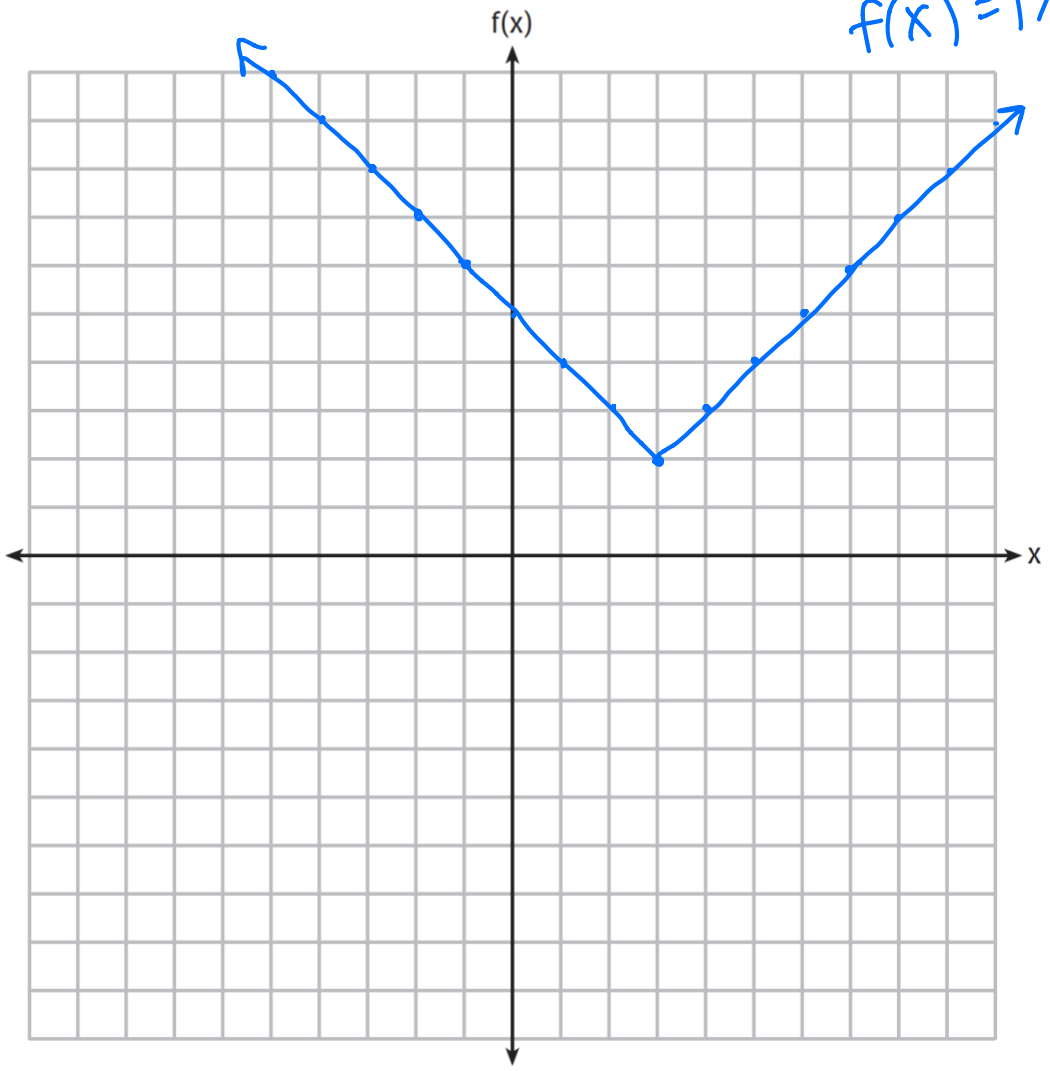
Notes: Graphing Absolute Value Functions

Do Now: Graph the equation $y = |x|$ on the coordinate plane below.

x	$\lvert x \rvert$	y	(x, y)
-3	$\lvert -3 \rvert$	3	$(-3, 3)$
-2	$\lvert -2 \rvert$	2	$(-2, 2)$
-1	$\lvert -1 \rvert$	1	$(-1, 1)$
0	$\lvert 0 \rvert$	0	$(0, 0)$
1	$\lvert 1 \rvert$	1	$(1, 1)$
2	$\lvert 2 \rvert$	2	$(2, 2)$
3	$\lvert 3 \rvert$	3	$(3, 3)$



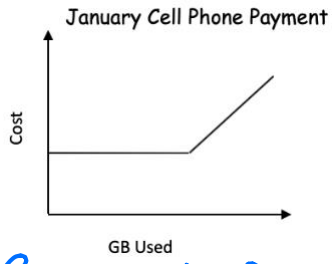
On the set of axes below, graph $f(x) = |x - 3| + 2$.



Success Criteria

- I can interpret a graph's meaning in a real-world context.

State the independent variable and the dependent variable. Then, describe how the variables are related throughout the graph.



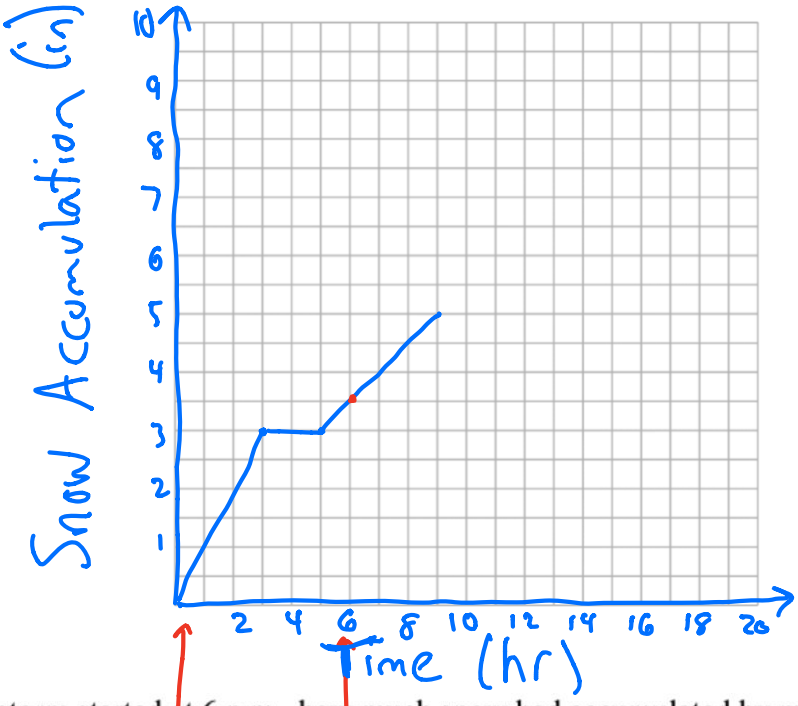
Independent Variable: GB Used Dependent Variable: Cost

The cost of the January cell phone payment is constant until the allowed GB are used, then the cost increases as GB are used.

- I can represent a real-world situation between two variables graphically.

During a snowstorm, a meteorologist tracks the amount of accumulating snow. For the first three hours of the storm, the snow fell at a constant rate of one inch per hour. The storm then stopped for two hours and then started again at a constant rate of one-half inch per hour for the next four hours.

a) On the grid below, draw and label a graph that models the accumulation of snow over time using the data the meteorologist collected.



b) If the snowstorm started at 6 p.m., how much snow had accumulated by midnight?

6pm midnight 3.5 inches

- I can determine whether a relation is linear or nonlinear.

Describe how you can verify whether a relation is linear or nonlinear when given an x-y table.

Check if the rate of change is the same between every set of points.

Describe how you can verify whether a relation is linear or nonlinear when given an equation.

If the equation can be written in the form $y=mx+b$ it is linear. If not, the relation is not linear.

Describe how you can verify whether a relation is linear or nonlinear when given a graph.

See if the graph forms a straight line with a constant rate of change.

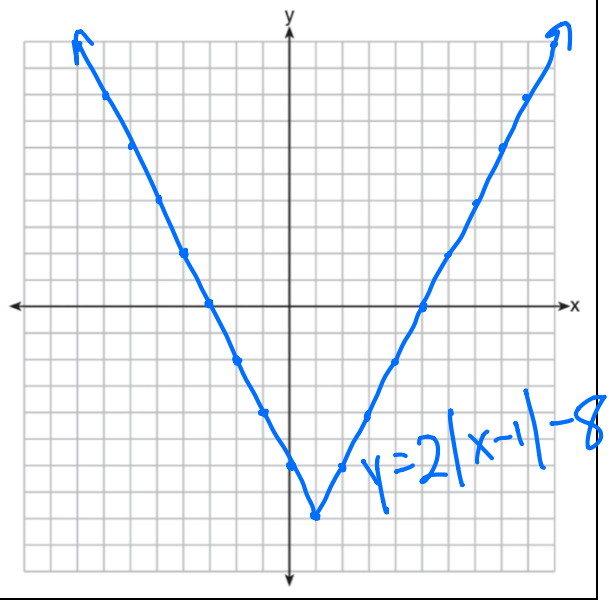
Describe how you can verify whether a relation is linear or nonlinear when given verbal description.

Try to make an x-y chart to tell which description has a constant rate of change.

- I can graph absolute value equations.

Graph the equation $y = 2|x - 1| - 8$ on the coordinate plane below.

X	Y
-2	-2
-1	-4
0	-6
1	-8
2	-6
3	-4
4	-2

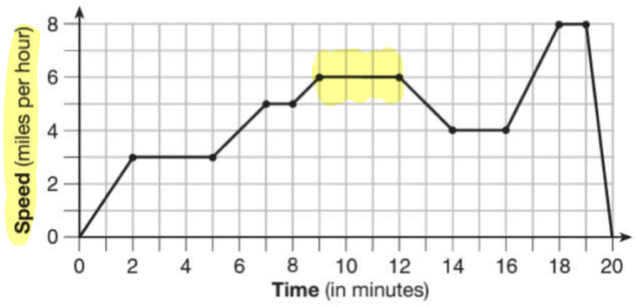


Name:_____ Date:_____

Classwork: Analyzing Graphs, Linear or Nonlinear, and Graphing Absolute Value Equations

1)

The graph below represents a jogger's speed during her 20-minute jog around her neighborhood.



Which statement best describes what the jogger was doing during the 9–12 minute interval of her jog?

(1) She was standing still.

(2) She was increasing her speed.

(3) She was decreasing her speed.

(4) She was jogging at a constant rate.

2)

Which equation does **not** represent a linear function of x?

A $y = -\frac{3}{4}x$

B $y = \frac{x}{2}$

C $y = -3 + 2x$

D $y = 3x^2 - 2$

3)

Which situation could be modeled by using a linear function?

(1) a bank account balance that grows at a rate of 5% per year, compounded annually

(2) a population of bacteria that doubles every 4.5 hours

(3) the cost of cell phone service that charges a base amount plus 20 cents per minute

(4) the concentration of medicine in a person's body that decays by a factor of one-third every hour

never constant

hours	4.5	9	13.5	18
pop	2	4	8	16

hour	0	1	2	3
medicine	81	27	9	3

4)

The height of a rocket, at selected times, is shown in the table below.

Time (sec)	0	1	2	3	4	5	6	7
Height (ft)	180	260	308	324	308	260	180	68

Based on these data, which statement is *not* a valid conclusion?

(1) The rocket was launched from a height of 180 feet.

(2) The maximum height of the rocket occurred 3 seconds after launch.

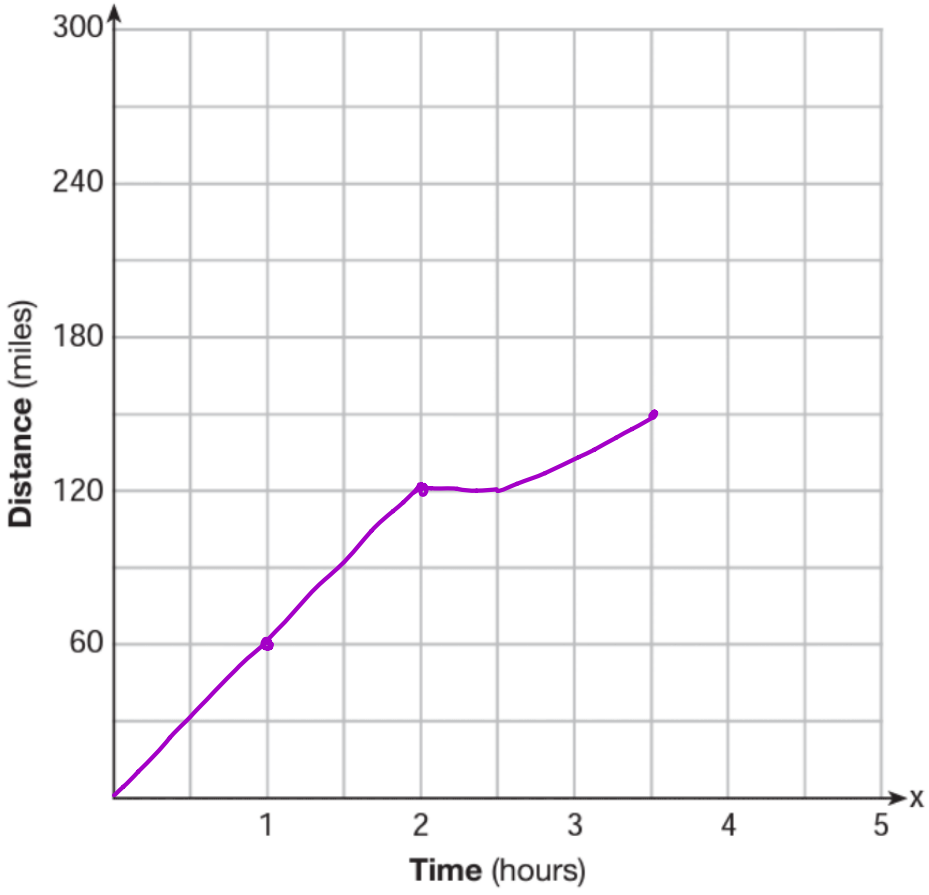
(3) The rocket was in the air approximately 6 seconds before hitting the ground.

(4) The rocket was above 300 feet for approximately 2 seconds.

5)

A driver leaves home for a business trip and drives at a constant speed of 60 miles per hour for 2 hours. Her car gets a flat tire, and she spends 30 minutes changing the tire. She resumes driving and drives at 30 miles per hour for the remaining one hour until she reaches her destination.

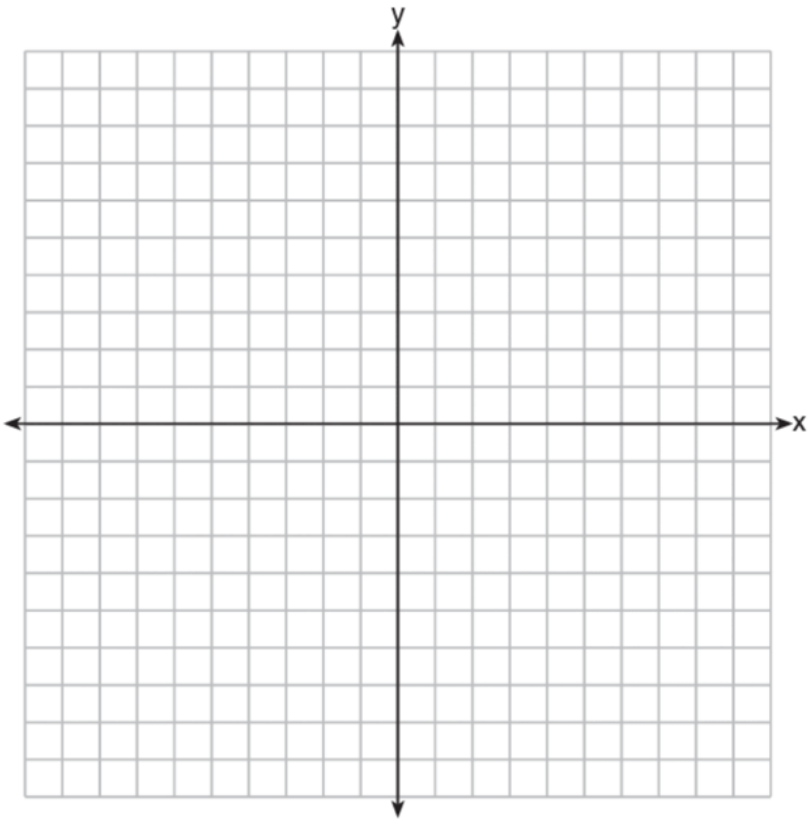
On the set of axes below, draw a graph that models the driver's distance from home.



6) Completely simplify the following expression:

$$(x - 4i)^2 - (3x - 2i)^2$$

7) Graph the equation $y = \frac{1}{2}|x + 4| + 1$ on the coordinate plane below.



8)

Which of the equations listed below are linear equations?

Equation I: $C = 2\pi r$

Equation II: $A = \pi r^2$

Equation III: $V = \frac{4}{3}\pi r^3$

A equation I only

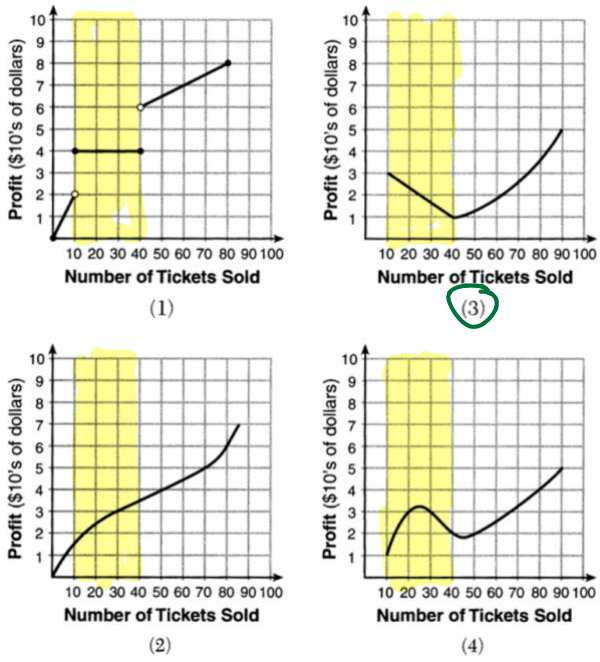
B equation II only

C equations I and III

D equations II and III

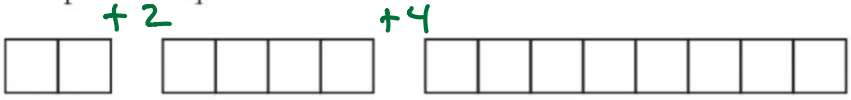
9)

To keep track of his profits, the owner of a carnival booth decided to model his ticket sales on a graph. He found that his profits only declined when he sold between 10 and 40 tickets. Which graph could represent his profits?



10)

Consider the pattern of squares shown below:

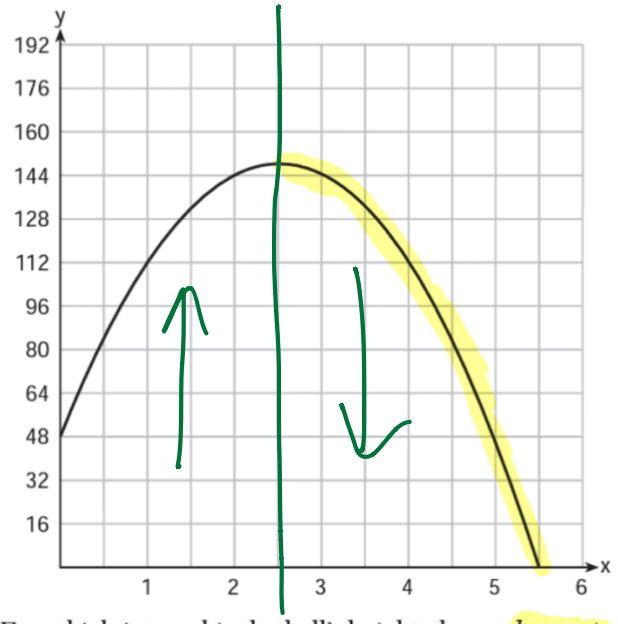


Which type of model, linear or exponential, should be used to determine how many squares are in the *n*th pattern? Explain your answer.

Exponential because the number of squares does not have a constant rate of change.

11)

A ball is thrown into the air from the edge of a 48-foot-high cliff so that it eventually lands on the ground. The graph below shows the height, y, of the ball from the ground after x seconds.



For which interval is the ball's height always *decreasing*?

(1) $0 \leq x \leq 2.5$

(2) $0 < x < 5.5$

(3) $2.5 < x < 5.5$

(4) $x \geq 2$

12)

The tables below show the values of four different functions for given values of x.

x	f(x)
1	12
2	19
3	26
4	33

x	g(x)
1	–1
2	1
3	5
4	13

x	h(x)
1	9
2	12
3	17
4	24

x	k(x)
1	–2
2	4
3	14
4	28

Which table represents a linear function?

(1) $f(x)$

(2) $g(x)$

(3) $h(x)$

(4) $k(x)$

13)

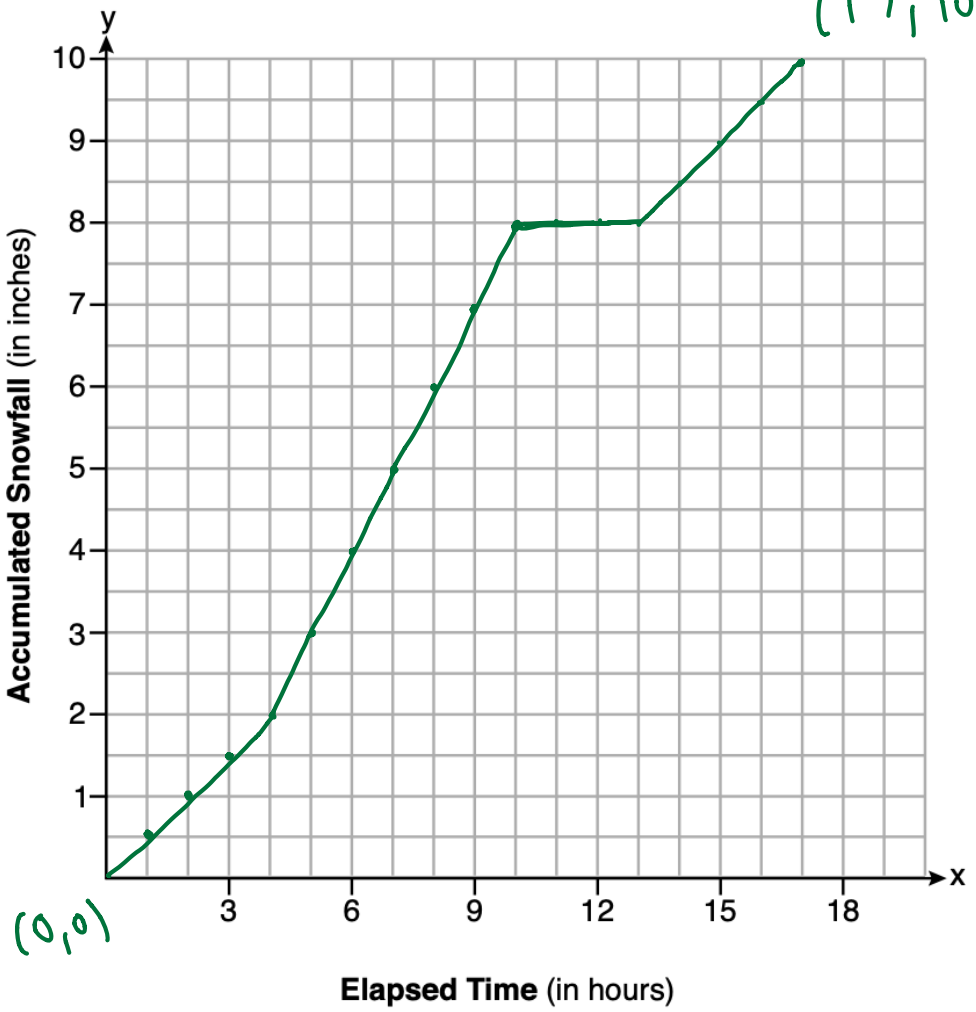
A snowstorm started at midnight. For the first 4 hours, it snowed at an average rate of one-half inch per hour.

The snow then started to fall at an average rate of one inch per hour for the next 6 hours.

Then it stopped snowing for 3 hours.

Then it started snowing again at an average rate of one-half inch per hour for the next 4 hours until the storm was over.

On the set of axes below, graph the amount of snow accumulated over the time interval of the storm.



Determine the average rate of snowfall over the length of the storm. State the rate, to the *nearest hundredth of an inch per hour.*

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{10-0}{17-0} = \frac{10}{17} \approx 0.59$ in/hr

14)

The function, $t(x)$, is shown in the table below.

x	t(x)
−3	10
−1	7.5
1	5
3	2.5
5	0

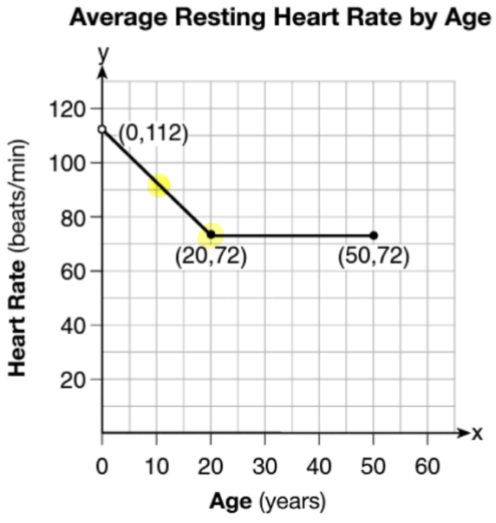
+2 +2 +2 +2 | -2.5 -2.5 -2.5 -2.5

Determine whether $t(x)$ is linear or exponential. Explain your answer.

Linear because t(x) has a constant rate of change.

15)

A graph of average resting heart rates is shown below. The average resting heart rate for adults is 72 beats per minute, but doctors consider resting rates from 60-100 beats per minute within normal range.



Which statement about average resting heart rates is *not* supported by the graph?

(1) A 10-year-old has the same average resting heart rate as a 20-year-old.

(2) A 20-year-old has the same average resting heart rate as a 30-year-old.

(3) A 40-year-old may have the same average resting heart rate for ten years.

(4) The average resting heart rate for teenagers steadily decreases.

16) Solve the following system of equations.

$-3(-7x + 2y = 18)$

$6x + 6y = 27$

$21x - 6y = -54$

$6x + 6y = 27$

$27x = -27$

$\frac{27x}{27} = \frac{-27}{27}$

$x = -1$

$6(-1) + 6y = 27$

$-6 + 6y = 27$

$+6 \quad +6$

$\frac{6y}{6} = \frac{33}{6}$

$y = \frac{33}{6}$

$\left(-1, \frac{33}{6}\right)$

Check:

$-7(-1) + 2\left(\frac{33}{6}\right) = 18$

$7 + 11 = 18$

$18 = 18$ ✓