

Algebra Story Graphs

Notes, Examples, and Practice Exercises

Topics include linear equations, curves, piecewise functions, xy-coordinate plane, and more.

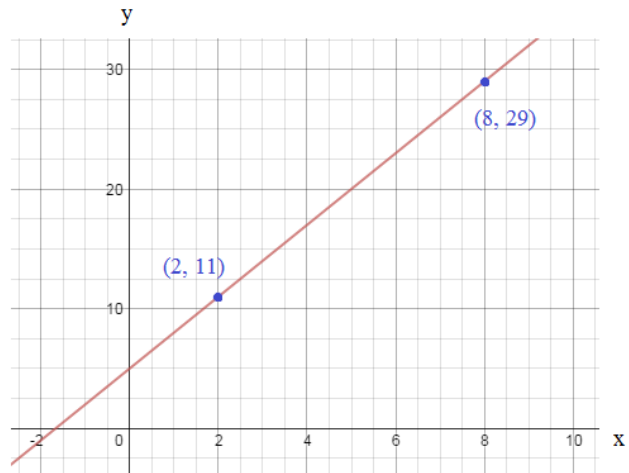
Introduction: A graph is a diagram that shows a relationship...

Example: $y = 3x + 5$

When x is 2, y is 11...
When x is 8, y is 29...

The graph at the right is a line that describes this relationship between x and y .

Each coordinate is a part of that equation...



"Story Graphs"

At the same time, a graph could be a story, where each point represents an event in time...

At 'time' x , y occurs...

Example: at time $x = 2$, $y = 11$ occurs..
at time $x = 8$, $y = 29$ occurs...

These points in time can be used to describe real events. And, the sequence of events could tell a story!

Creating a story:

Imagine, we let x be points in time (in minutes)
 y be floors of a building....

This could be an athlete running up flights of stairs from the 5th floor to the 32nd floor...

Telling the story: Sketching a graph

But, we need to make it describe the 'story'...

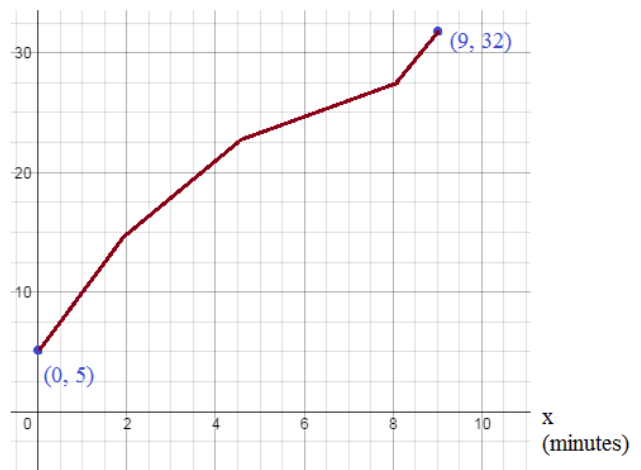
1) The person begins on the 5th floor at time $x = 0$
(Also, we cannot have 'negative' time!)

2) And, the person stops at the 32nd floor...

So, the domain will be $0 \leq x \leq 9$
range will be $5 \leq y \leq 32$

3) The rates of change won't be constant...
Maybe, the athlete starts out fast, then begins to tire...
(so, the rate of change decreases)...
Then, there is a burst of energy at the end of the climb..

y (building floor)



Telling another story:

The story can change...

a) What if a second athlete increased/decreased speeds more often?

The graph would contain more segments (or curves).

b) What if the athlete stopped for a 2-minute break?

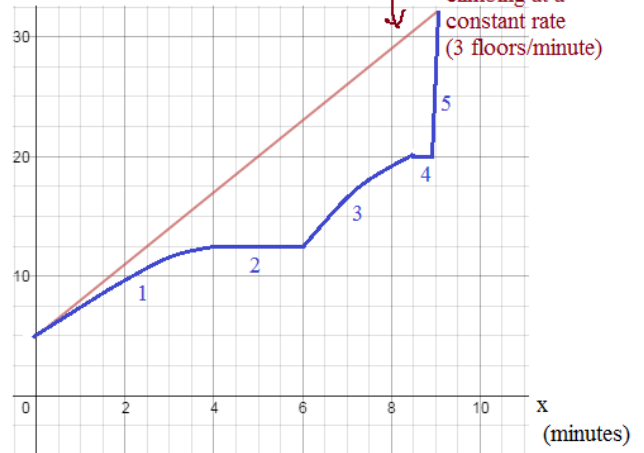
There would be a horizontal line segment..

c) What if the athlete took an elevator from the 20th to 32nd floor?

There would be a near vertical line at the end...

1. Climbing -- first 2 minutes at constant rate. Then, next 2 minutes gradually slowing down
2. 2-minute rest
3. Resume climbing at faster rate
4. Stop/Wait for elevator
5. Use elevator for final 12 floors

y (building floors)



"Story Graphs"

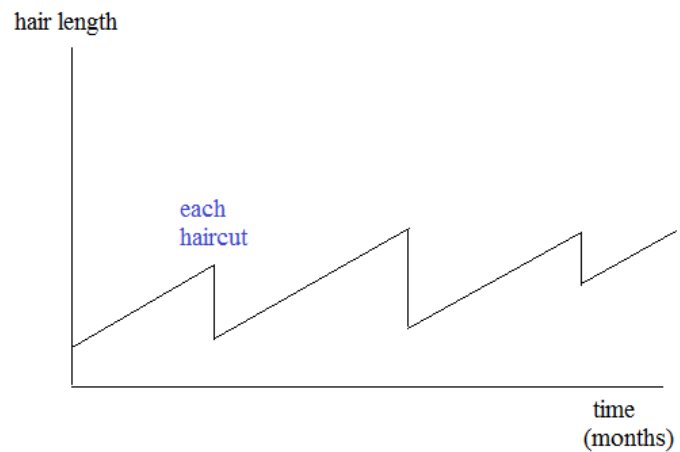
Example: Last year, Jill went to her favorite hair stylist 3 times for haircuts. Write a story graph demonstrating her hair length.

The graph shows the relationship between hair length and time...

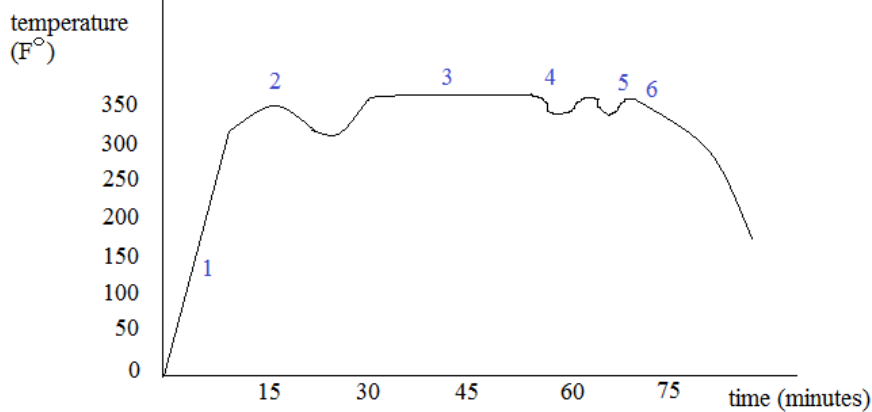
The story shows Jill's hair length...

Interpretations:

- 1) She had 3 haircuts last year, illustrated by abrupt drops in length...
- 2) Her final haircut was less than the others... (Perhaps, it was a new style? Or, maybe it was winter time, so she wanted a longer length?)
- 3) Her hair grew back each time at the same rate. (increasing slopes are the same)



Example: Oven temperature when baking a cake....

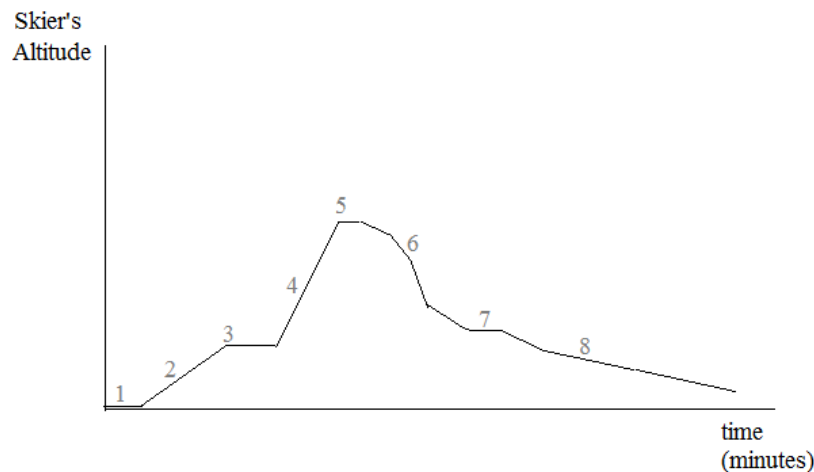


The relationship is temperature (fahrenheit degrees) vs. time (minutes).

Notice the changing shape of the graph as it relates to the story...

1. preheat oven
2. place cake in oven
3. bake cake
4. open door (to check the cake)
5. take out cake
6. turn off oven

Example: Can you provide a possible story for the graph?

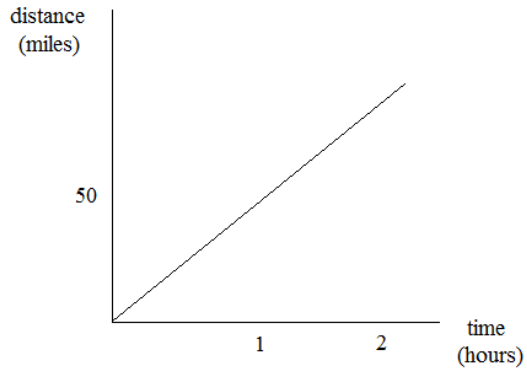
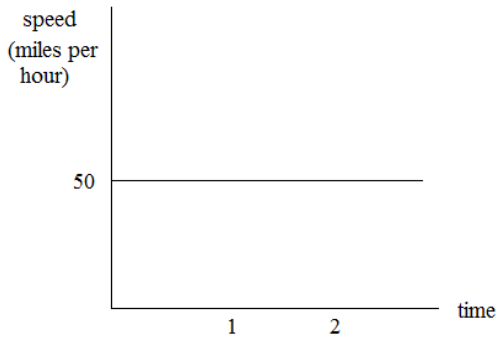


1. wait in ski lift line
2. ride lower ski lift
3. get off
4. ride upper ski lift
5. get off
6. ski down upper mountain
7. take a break
8. ski down lower mountain

Example: a car traveling at a constant rate of 50 miles per hour

Distance/Time vs. Speed/Time

"Story Graphs"

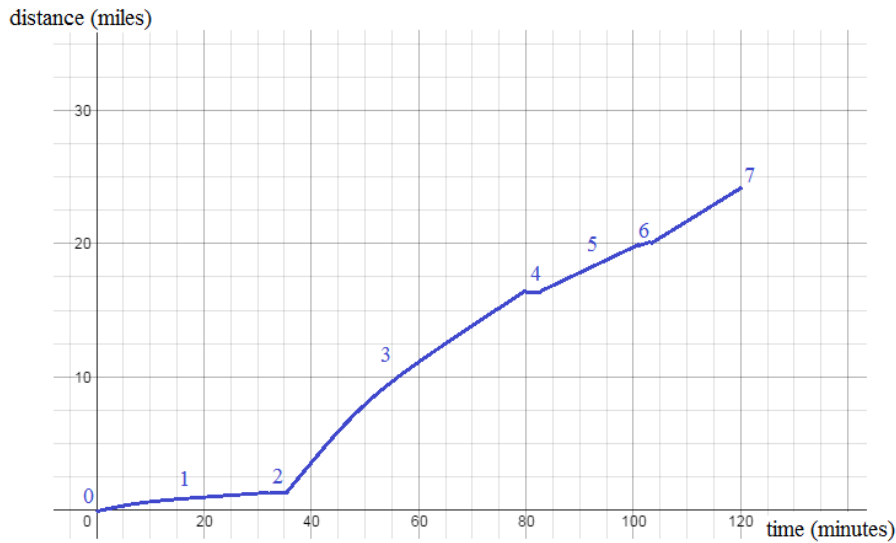


Note the difference in these models.
The story is being told in two different ways!

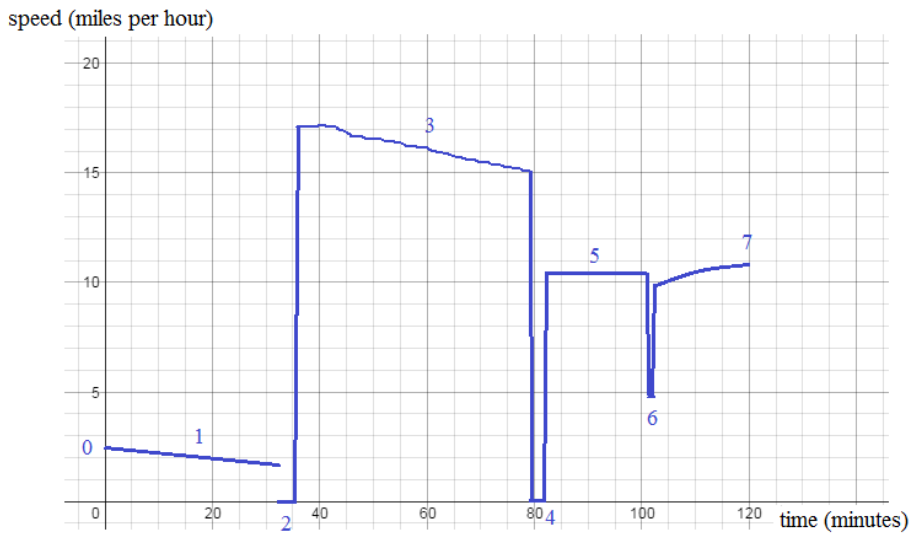
Example: A sprint triathlete swims, bikes, and runs a race in 2 hours.

Sketch a story graph for the triathlete:

- a) using *distance* as a function of time
- b) using *speed* as a function of time



- 0. start
- 1. swimming leg
slows down as the athlete gets tired
- 2. changes clothes
- 3. biking leg
- 4. change to running shoes
- 5. running leg
- 6. slow down for water
- 7. finish



Constructing Story Graphs (Models)

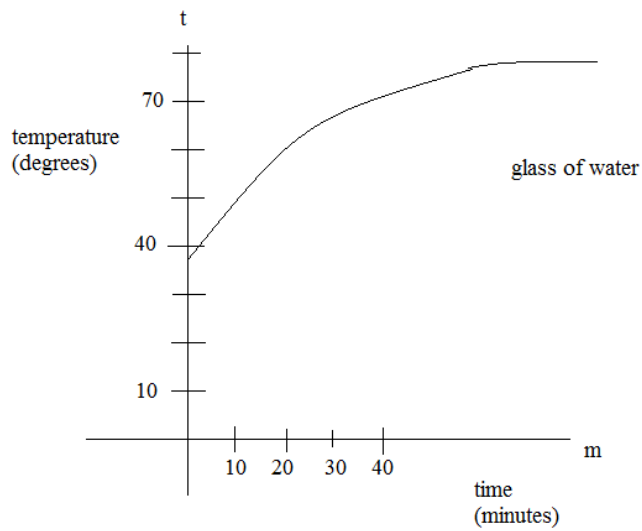
Step 1: Draw and Label Axes

Step 2: Sketch the relationship (linear, exponential, etc..)

Step 3: Note the domain and range (to determine any endpoints)

Example: A temperature of a cold glass of water decreases in the dining room.
Create a possible graph.

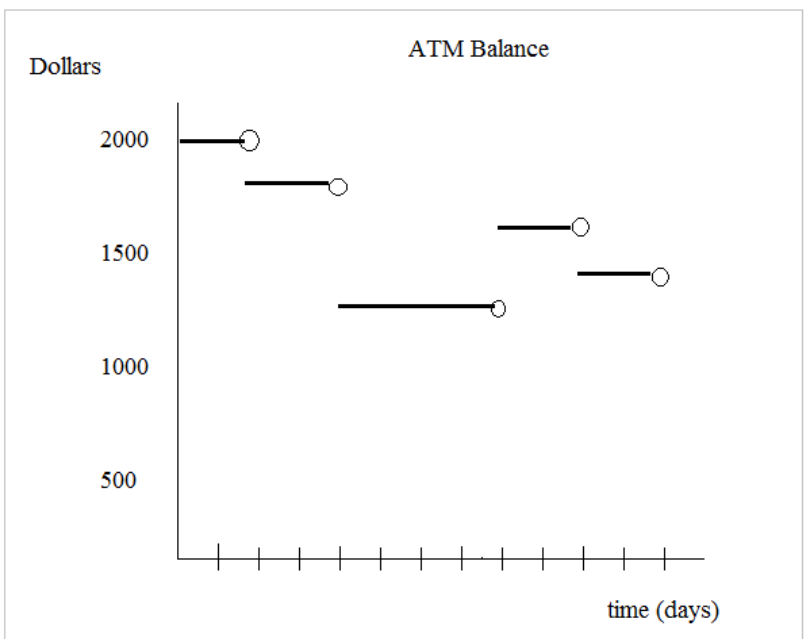
The relationship is temperature (in degrees)
as a function of time (in minutes)



The domain is $m > 0$
(because time cannot be negative)

The range is $38 < d < 78$
(the water is 38 degrees when it's in the refrigerator.
And, room temperature is 78, so it approaches that value)

Example:



What is the initial balance?

Initial balance occurs when $t = 0$...
Therefore, initial balance is 2000 dollars

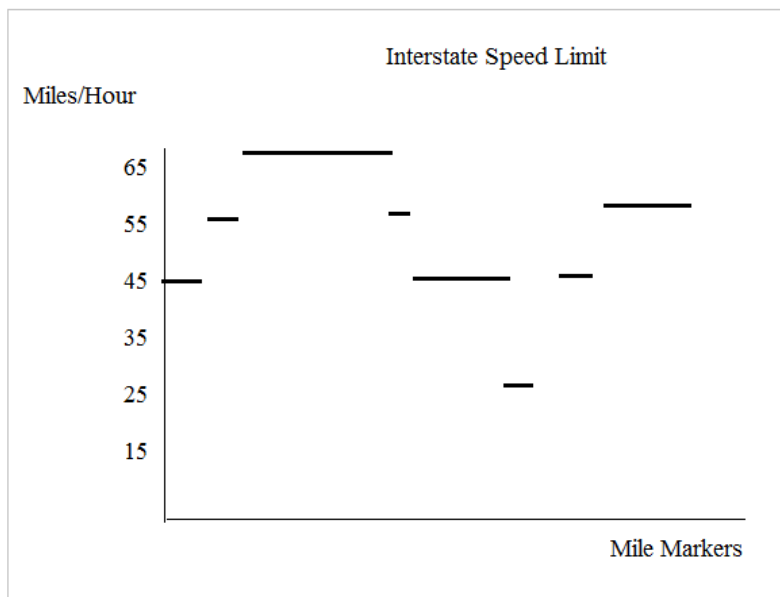
How many withdrawals were made?

If a withdrawal occurs, the amount will "gap lower"...
This occurs 3 times...

How many deposits?

If a deposit occurs, the amount will "gap higher"..
This occurs once..

Example:



Explain a possible representation of the graph.

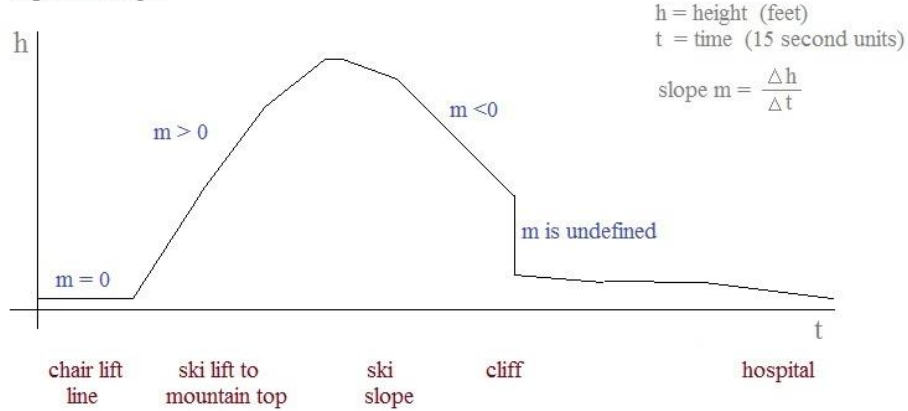
Each discontinuity represents a speed limit sign.

The 65 mph would occur on an interstate highway.

The drop to 25 mph would occur when the road passes through a town.

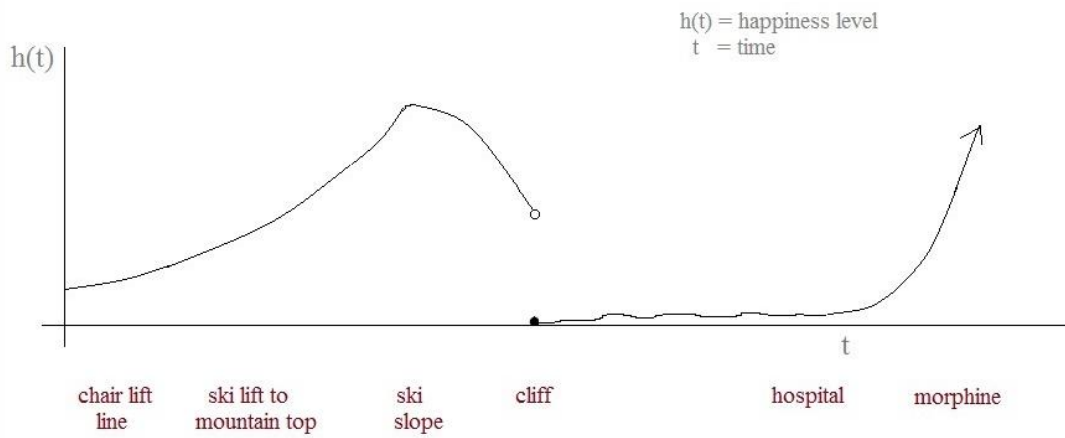
(Note: this is just a model. It's unlikely a car would instantaneously change speeds. Instead the graph would be continuous.)

Algebra I: Slope



Math Graphs
&
Skiing

Algebra II: Continuity and End Behavior



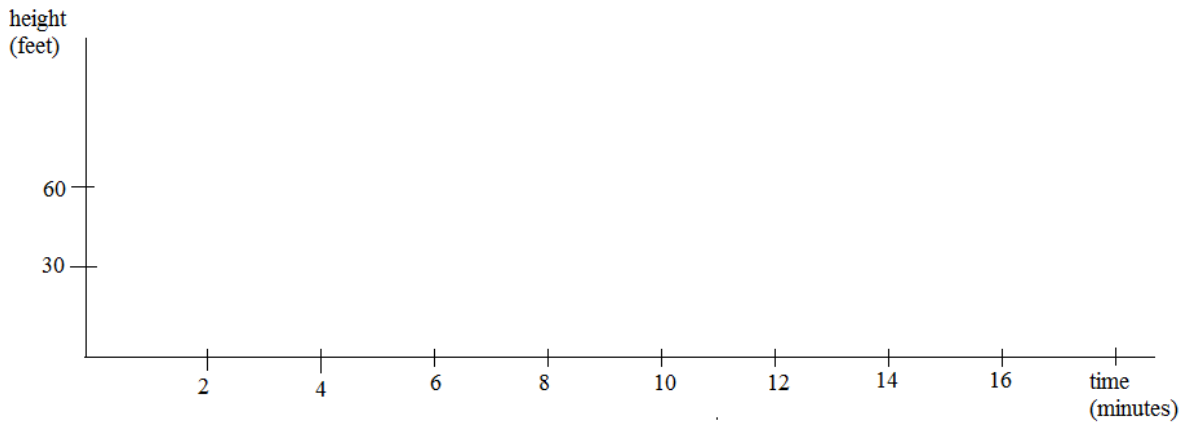
*"Watch out for
Vertical Drops!"*
(suggestion for skiers and
math students)

L. Friedman #13 1-8-12
www.mathplane.com

Practice questions ->

Practice Exercises:

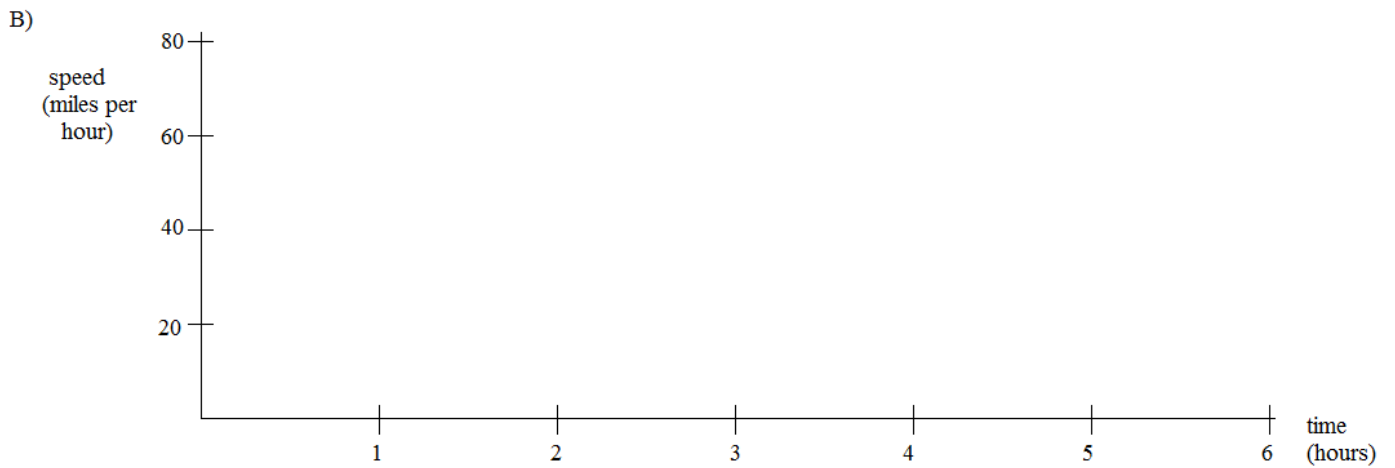
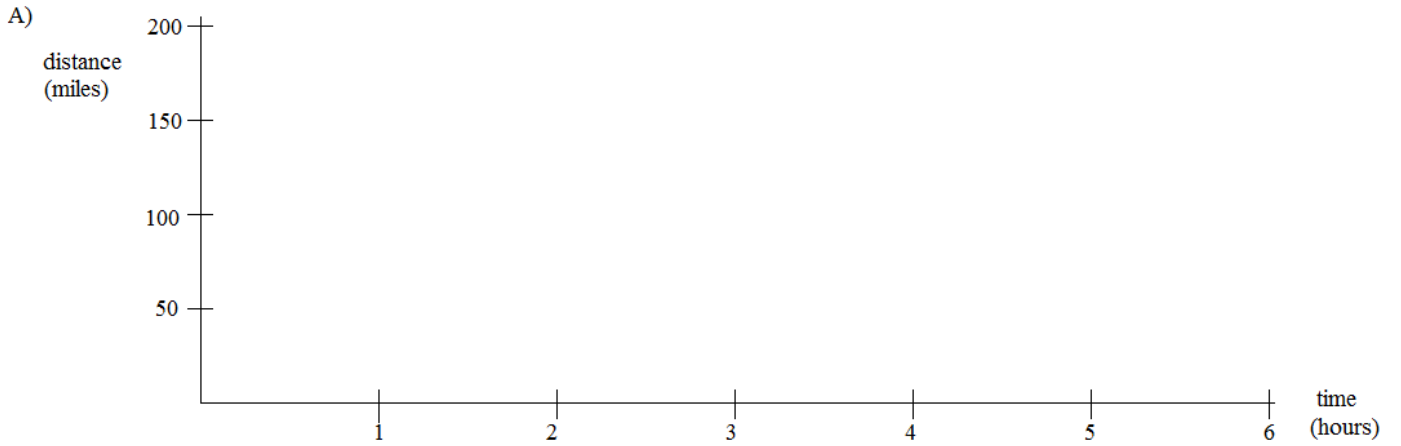
- 1) Sketch a story graph of a ferris wheel ride.
Show the height above ground as a function of time in minutes.



- 2) Sketch a story graph of a 6-hour road trip.
(Include the following events: stopping for gas, dinner break, getting lost and backtracking, rush hour traffic.)

Graph A) distance as a function of time

Graph B) speed as a function of time

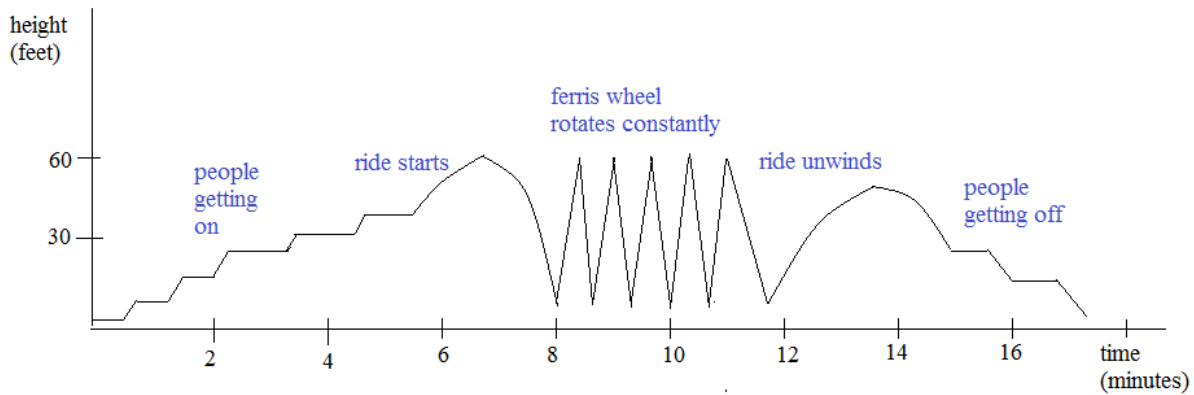


Practice Exercises:

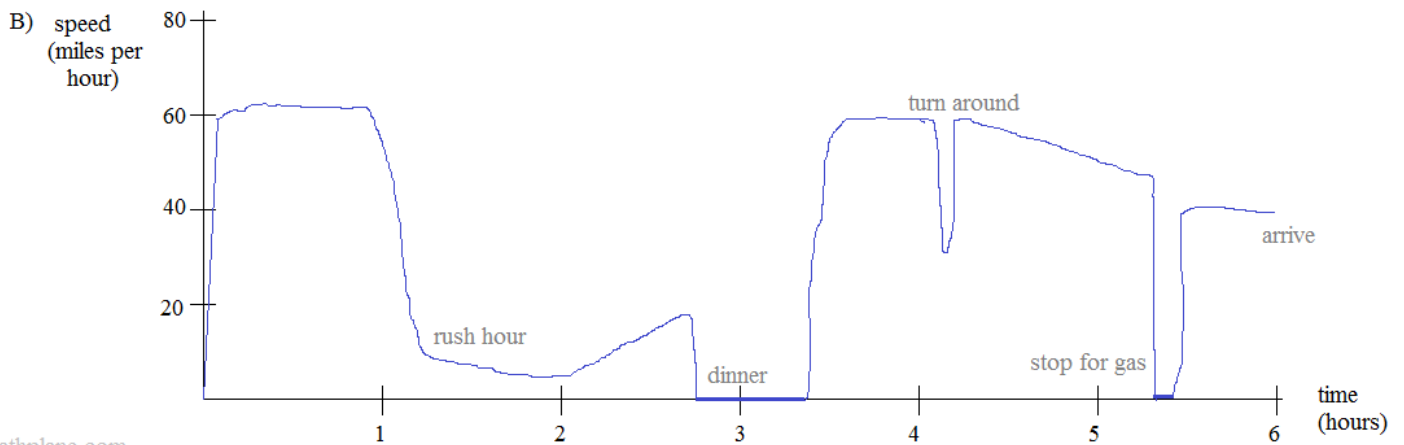
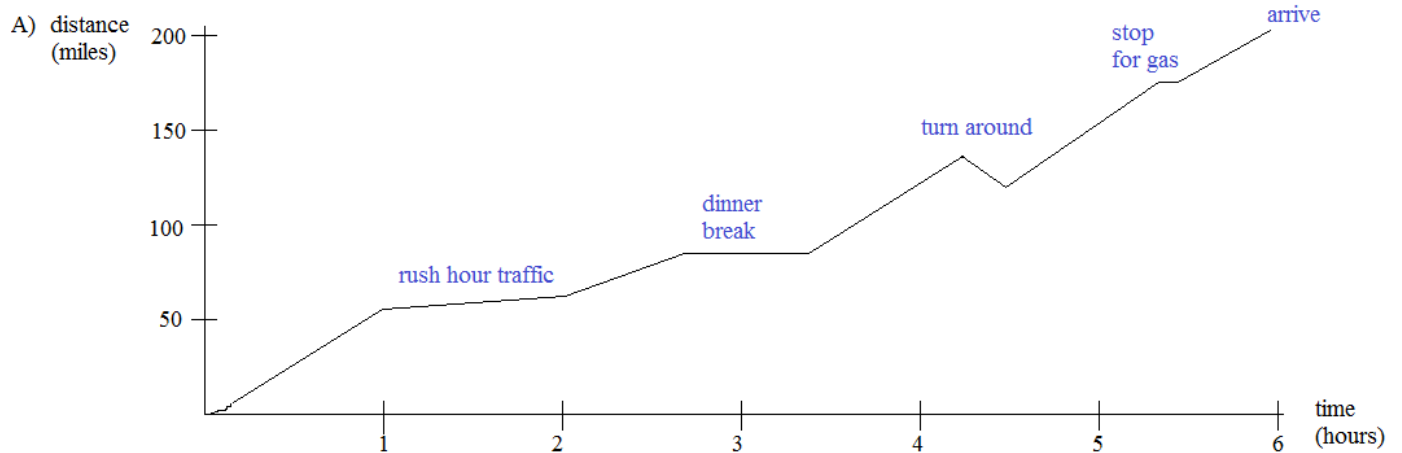
SOLUTIONS
(there are others)

"Story Graphs"

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Show the height above ground as a function of time in minutes.



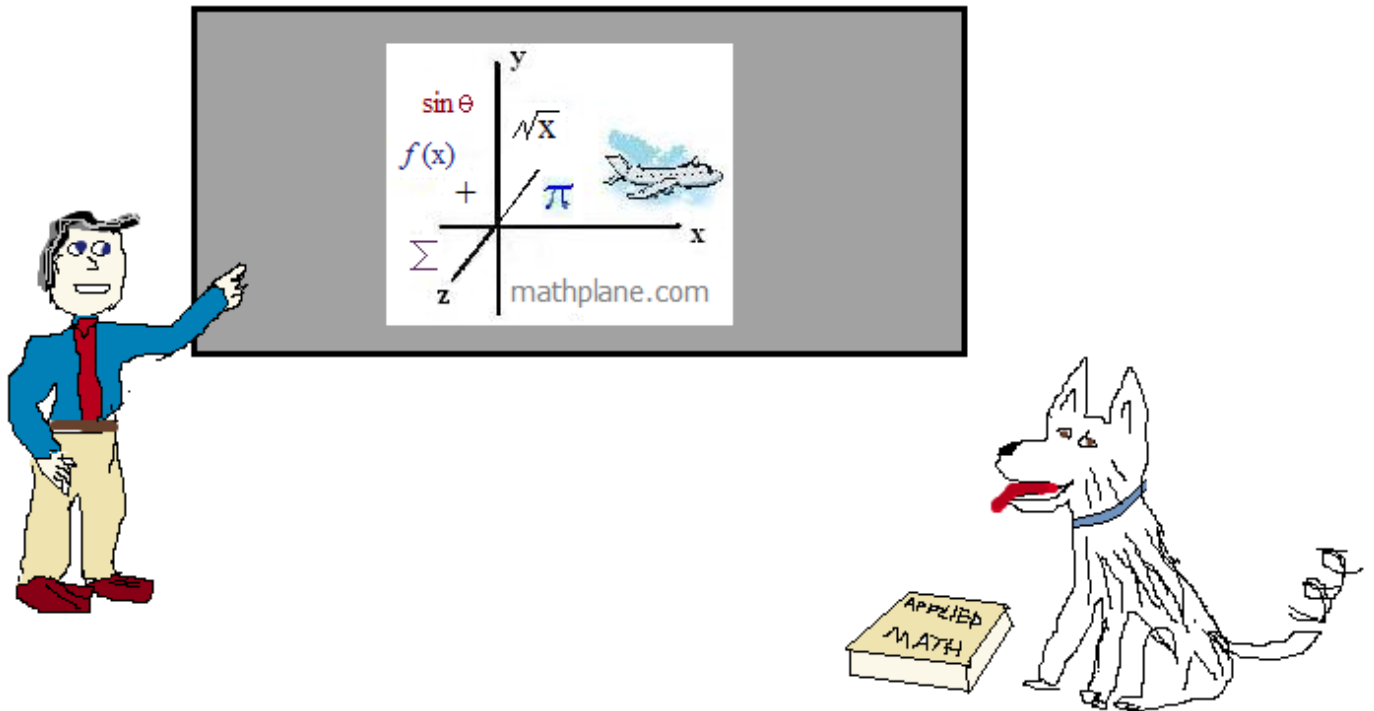
- 2) Sketch a story graph of a 6-hour road trip.
(Include the following events: stopping for gas, dinner break, getting lost and backtracking, rush hour traffic.)
Graph A) distance as a function of time
Graph B) speed as a function of time



Thanks for visiting. (Hope it helped!)

If you have questions, suggestions, or requests, let us know.

Cheers



Also, at mathplane.ORG for mobile and tables.

And, our stores at TeachersPayTeachers and TES