MATH 1311

Section 6.1

Velocity

Velocity is a vector measure. This means that is has components for magnitude (how fast) and direction (heading which way).

This means that you can estimate a velocity function from a directed distance function.

Positive Velocity means an object is moving up, away, or to the right.

Negative Velocity means the object is moving down, towards, or the left

Two graphs from a rock thrown into the air:

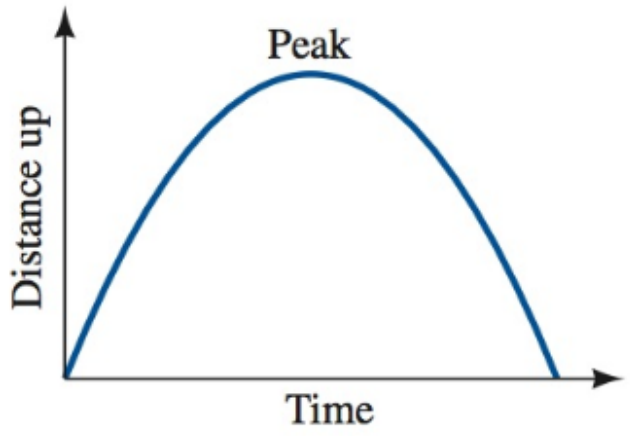

FIGURE 6.1 Distance up of a rock versus time

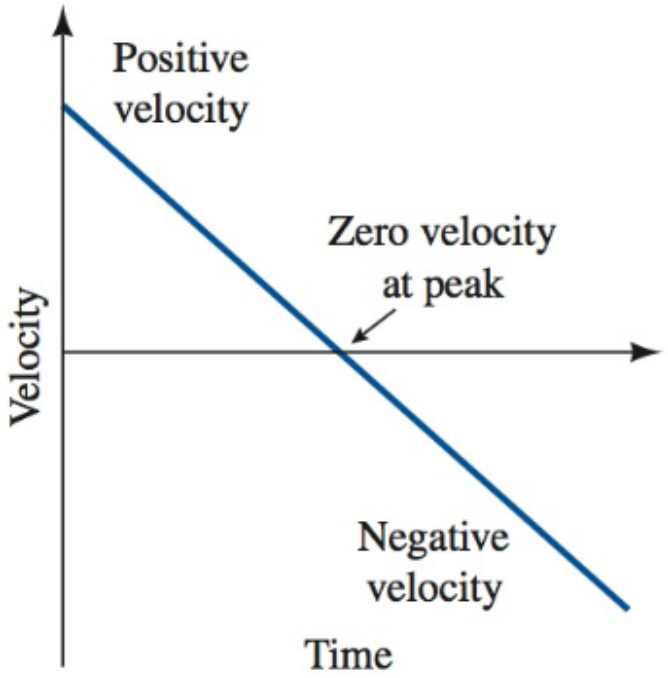

FIGURE 6.2 Velocity of a rock versus time

Key Characteristics of Velocity

KEY IDEA 6.1 **VELOCITY AND DIRECTED DISTANCE: THE FUNDAMENTAL RELATIONSHIP**

1. Velocity is the rate of change in directed distance.
2. **When directed distance is increasing, velocity is positive.** (The graph of velocity is above the horizontal axis.)
3. **When directed distance is decreasing, velocity is negative.** (The graph of velocity is below the horizontal axis.)
4. **When directed distance is not changing, velocity is zero.** (The graph of velocity is on the horizontal axis.)

Constant Velocity

If an object is considered to have a constant velocity (equal to a number), that means that the distance function is linear.

Example:

You leave home at 8:00 am and travel to school. It takes you 1 hour to arrive at school and you remain there for 5 hours. Then you travel back home (also taking 1 hour).

Sketch a graph to show your distance from home as a function of time.

Use this graph to create a graph of your velocity for that trip.

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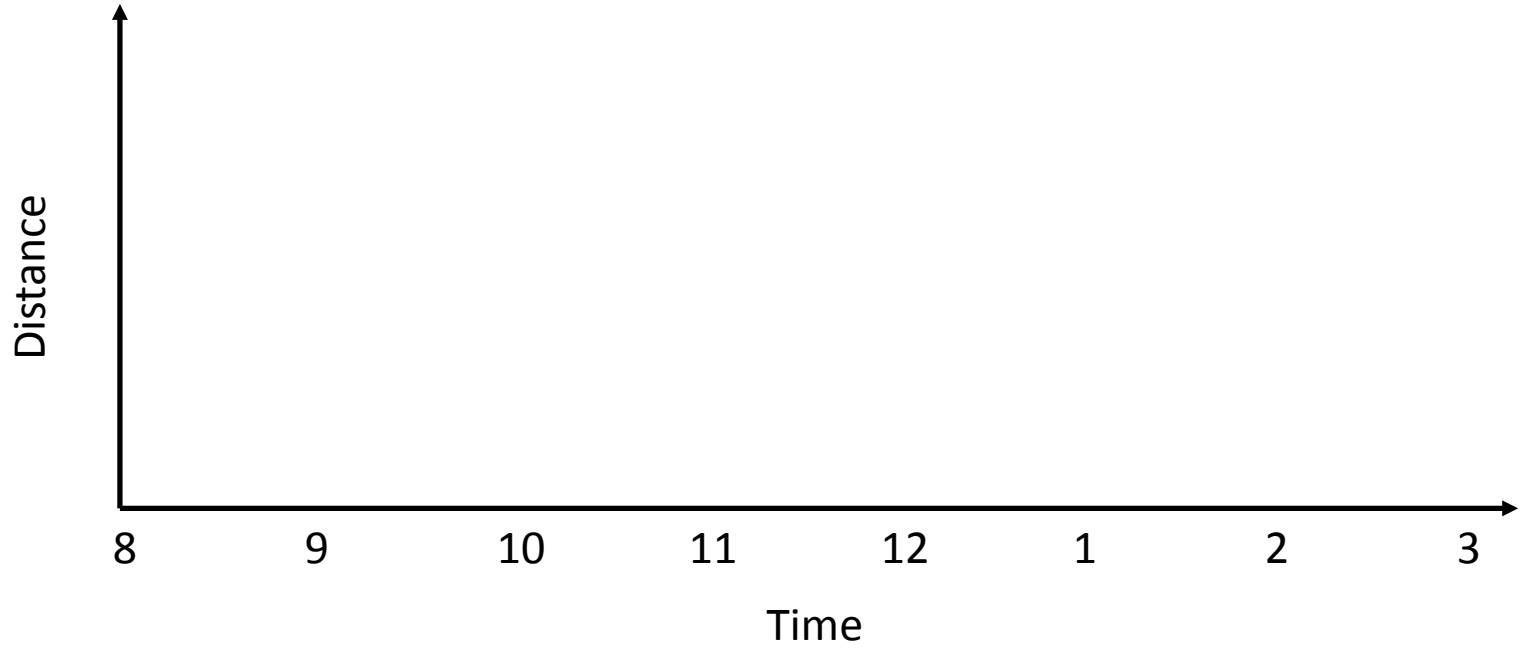

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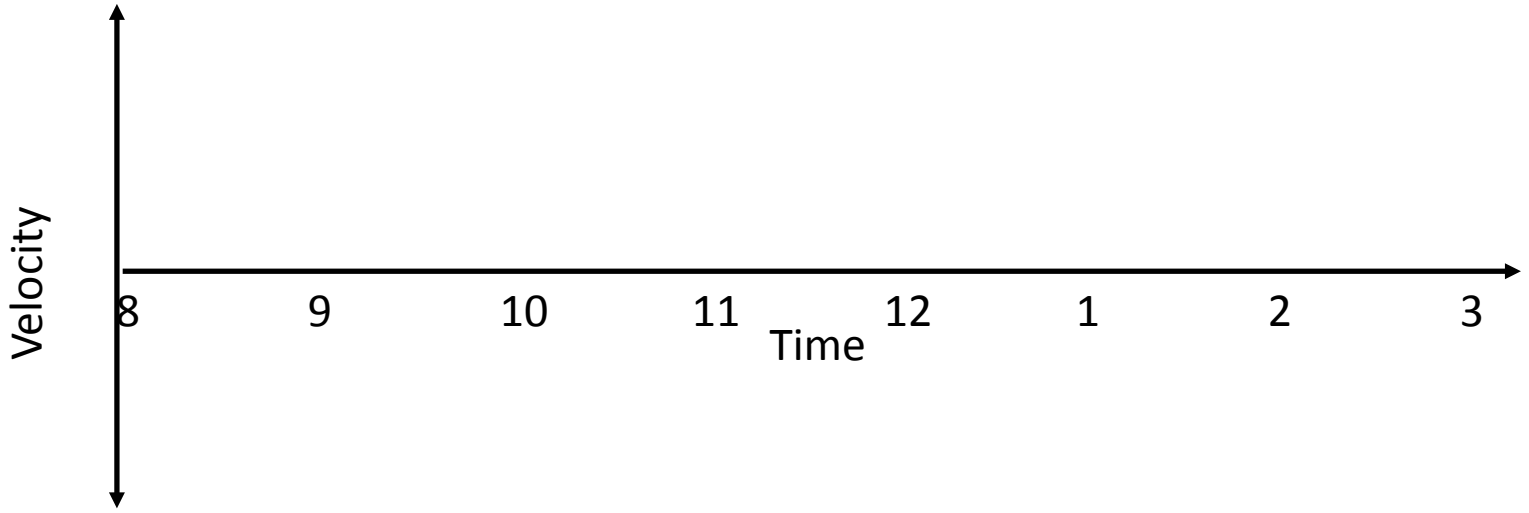

Distance given by a formula:

The height of a rock thrown from a building is given by

$h(t) = -16t^2 + 25t + 120$ where t is measured in seconds and h is measured in feet.

Sketch this graph (using the calculator) and determine the t-values where the maximum height occur and where the rock hits the ground.

Use this to estimate the graph of the rock's velocity.

Distance given by a formula:

The height of a rock thrown from a building is given by

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Sketch this graph (using the calculator) and determine the t-values where the maximum height occur and where the rock hits the ground.

Use this to estimate the graph of the rock's velocity.

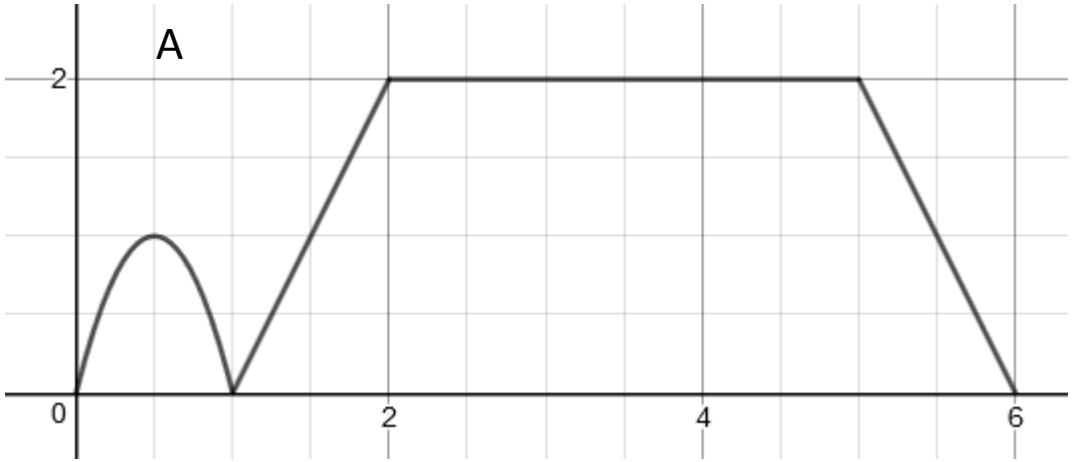
The actual velocity formula is: $v(t) = -32t + 25$. Graph this as well. How does this function compare to your estimate of the rock's velocity?

You leave home at 9:00 am and travel for thirty minutes. Then you realize that you left the oven on, so you return home at the same speed. You then travel for 1 hour to your destination, where you stay 3 hours before returning home again.

1. Which graph would best represent your distance graph for this situation?

2. Which graph would best represent your velocity graph for this situation?

A



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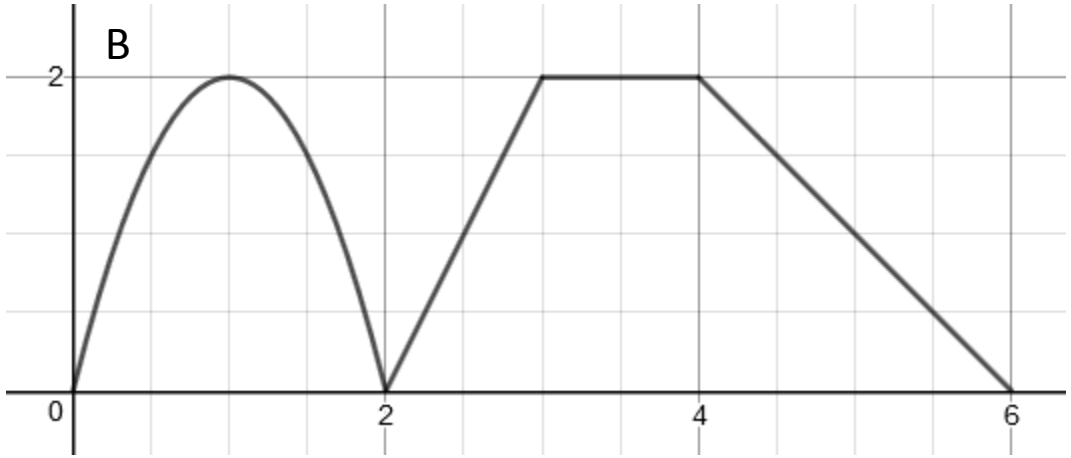

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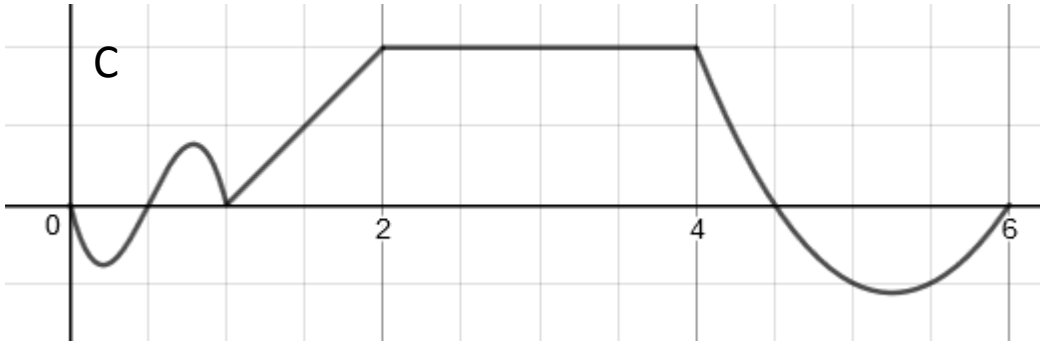

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