Rates of Change
Section 2.1

“Speed is often confused with insight. When I start running earlier than others, I appear faster.”
– Johan Cruyff
Today’s Questions.

- What is change?
- What is a rate of change?
- What is an *instantaneous* rate of change?
Think - Pair - Share.

You are the Chief of Police for the local police department. Unfortunately, your department has no speed guns. Devise a plan to catch speeding cars on a ten mile stretch of highway.

The speed limit on this highway is 65 miles per hour.
The graph below shows a car’s position versus time. When is the car going fastest?

A. $t = 0$   B. $t = 0.05$   C. $t = 0.1$   D. $t = 0.15$
Think - Pair - Share.

Would this car get a speeding ticket under your plan? Should they get a ticket?
1. Below is a table of positions and times for the car in question. Compute the average speed for each of the 0.05 hour intervals.

<table>
<thead>
<tr>
<th>time (hr)</th>
<th>0.00</th>
<th>0.05</th>
<th>0.10</th>
<th>0.15</th>
</tr>
</thead>
<tbody>
<tr>
<td>position (mi)</td>
<td>0.00</td>
<td>2.84</td>
<td>5.83</td>
<td>9.18</td>
</tr>
</tbody>
</table>

2. The car’s average speed over 10 miles was 53.5 miles per hour. How long did it take the car to go 10 miles?

3. Suppose \( p = 4.94 \) miles when \( t = 0.09 \) hours. Use this information to approximate the car’s speed when \( t = 0.10 \) hours.
Today’s Questions.

- What is change?
- What is a rate of change?
- What is an *instantaneous* rate of change?
Brainstorm.

Here’s a graph of the car’s speed. What are the advantages and disadvantages of using speed guns to catch speeders?
Brainstorm.

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Think - Pair - Share.

You are driving on a highway and you need to turn left in exactly ten miles. Unfortunately, your car odometer isn’t working and you don’t have a smart phone/GPS. Devise a plan to figure out when to turn.

Does it matter if the speed limit changes at some point on the road?
Today’s Questions.

- What is change?
- What is a rate of change?
- What is an *instantaneous* rate of change?
- Why do we care?