FUNCTIONS EXPERIMENT
ROLLING BASKETBALL

Introduction
We have been discussing linear regression, and in this experiment you will see an example of a function that is very close to being linear but not exactly linear. You will roll a basketball across a tile floor and record the distance of the ball from the motion detector as a function of time.

Equipment and Setup
For this experiment you will need a TI calculator with the Vernier PHYSICS program loaded, a CBL unit, a motion detector, and a basketball.

Plug the motion detector into SONIC on the CBL unit. Select the PHYSICS program on the calculator. In the home menu choose SET UP PROBES. When asked for the number of probes, enter 1. In the next menu choose MOTION. The screen will display the home menu again. Now select COLLECT DATA, and choose TIME GRAPH. Set the calculator to take 15 measurements 0.07 second apart.

Procedure
When the calculator is ready to begin taking measurements, place the motion detector on the floor, and make sure there is a long and wide open area in front of the detector. Place the basketball at least 18 inches in front of the motion detector. Coordinate with another group member to begin taking measurements and rolling the ball away from the detector at the same time. After collecting the data, view the graph of distance versus time. (Press ENTER to move from the graphing screen back to the SELECT GRAPH menu.)

Data
Record the distances collected by the calculator in the table below.

<table>
<thead>
<tr>
<th>Time in seconds</th>
<th>0.07</th>
<th>0.14</th>
<th>0.21</th>
<th>0.28</th>
<th>0.35</th>
<th>0.42</th>
<th>0.49</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance in meters</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time in seconds</td>
<td>0.56</td>
<td>0.63</td>
<td>0.70</td>
<td>0.77</td>
<td>0.84</td>
<td>0.91</td>
<td>0.98</td>
</tr>
<tr>
<td>Distance in meters</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Analysis
1. Based on the data, find the equation of the regression line for distance as a function of time. Remember to identify any variables you use.

2. Check that your formula makes sense by graphing your formula with the data. Sketch the graph below.

3. Identify the slope in your formula. What is the practical meaning of this?

4. Why should we expect the data in this experiment to be linear?