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Worksheet 01

1. My friend and I are slightly bored and decide to figure out how fast I can throw a ball up in the air. We find a baseball and a tall apartment building. The building will help us measure since each level of a typical residential building is 10 feet tall. I throw the ball straight up while my friend takes a video. Reviewing the video, we build the following table, which lists the height $h(t)$ of the ball at a given time t measured in seconds since I threw the ball.

t (in seconds)	0	0.5	1	1.5	2	2.5	3
$h(t)$ (in feet)	6	52	90	120	142	156	162

(a) How tall am I?

- (b) What is the average velocity of the ball from second 0 to second 1? Call this A_1 . How about from second 1 to second 2? Call this A_2 .

$$A_1 =$$

$$A_2 =$$

To see how fast I throw, let's try to find the velocity of the ball at time $t = 1$. Let's write $v(t)$ for velocity, so we want to find $v(1)$.

- (c) Which of the following statements is most reasonable: $A_1 = v(1)$, $A_1 < v(1)$, or $A_1 > v(1)$?

- (d) Repeat for A_2 . Which is most reasonable: $v(1)$, $A_2 < v(1)$, or $A_2 > v(1)$?

Here's the data again:

t (in seconds)	0	0.5	1	1.5	2	2.5	3
$h(t)$ (in feet)	6	52	90	120	142	156	162

(e) What is the average velocity of the ball over the interval $[0.5, 1]$? How about $[1, 1.5]$?

(f) Give your best estimate of $v(1)$ and explain. *What would you need to improve your estimate?*

(g) Plot the data from the table on the graph below, and sketch the graph of $h(t)$.

(h) Draw the line that passes through $(0, h(0))$ and $(1, h(1))$ on the graph below. Repeat for the line passing through $(1, h(1))$ and $(2, h(2))$. **Find the slopes** of these two lines and **describe how these slopes compare to the average velocities** you found in part (b)?

