## Reminders:

- Post-class activities are to be worked out in ClassKick.
- There is nothing to turn in your work is saved automatically on ClassKick.
- They are graded check/x on the basis of completeness and effort.
- You can work freely with others on these, but please for your own benefit, don't just copy work.
- If you need help or want Prof. Talbert to check your work, use the "raise hand" feature on ClassKick.

## Connecting derivatives and velocity

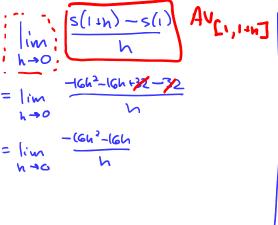
This activity goes through the following problem step by step:

## Velocity

A water balloon is tossed vertically in the air from a window. The balloon's height in feet at time t in seconds after being launched is given by  $s(t) = -16t^2 + 16t + 32$ .

What is the instantaneous velocity of the balloon at t = 1 second?

Set up — but do not yet evaluate — the limit that will compute the instantaneous velocity of the balloon at time t=1.



$$S(t) = -|Gt|^{2} + |Gt|^{2} + |Gt|^{2}$$

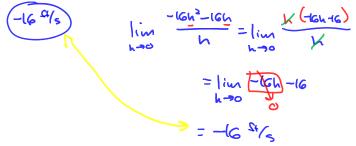
$$S(1) = -|G(1)|^{2} + |Gt|^{2} + |Gt|^{2}$$

$$= -|G(1+h)|^{2} + |G(1+h)|^{2} + |G(1+h)|^{2}$$

$$= -|G(1+2h+h^{2})|^{2} + |G(1+h)|^{2}$$

Graph s(t) on Desmos upload an image of your graph. On the graph, draw the point (1,s(1)) and the tangent line to the graph of s at t=1. Then estimate what you think the value of the instantaneous velocity of the balloon at t=1, and explain your reasoning.

Now compute the limit you set up to find the *exact* value of the velocity of the ball at t=1. The answer should agree with your estimate from the last slide; if not, debug your work.



## Reflecting

Overall, how comfortable do you feel with the concepts of this lesson? What questions, comments, or concerns do you have about Module 1B so far?