Class Activity: Limits and Instantaneous Velocity

This is Activity 1.5 in your book, with a little more structure placed around it. Please work in groups of 1–3. You do NOT need to turn this in, so just use this handout as a template for notes. Do, however, ask questions if you have any.

In the following we are working with the function

$$s(t) = t^2$$

which models the position (in meters) of a moving object at time t minutes.

1. Determine a simplified expression for the average velocity of the object on the interval $[3, 3+h]$ by first recalling that
$$AV_{[a,a+h]} = \frac{s(a+h) - s(a)}{h}$$

   (a) What is the value of a here? Is the value of h a fixed number, or a variable?

   (b) Calculate and fully simplify the expression $s(3+h)$.

   (c) Calculate $s(3)$

   (d) Calculate and simplify $s(3+h) - s(3)$.

Continued →

(e) The average velocity on $[3, 3+h]$ is now the fraction given in the formula above. Calculate and fully simplify this fraction. There should be no fractions in your result — watch your algebra.

2. Use your result from the previous question to find the average velocity of the object on the interval $[3, 3.2]$, and include units on your answer.

3. Determine the instantaneous velocity at $t = 3$ by filling the values on these tables and then using the results:

Time interval	AV on this time interval
$[2.8, 3]$	
$[2.9, 3]$	
$[2.99, 3]$	
$[2.999, 3]$	

Time interval	AV on this time interval
$[3, 3.2]$	
$[3, 3.1]$	
$[3, 3.01]$	
$[3, 3.001]$	