WS9-Introduction to Rates **NAME: ____________________________**

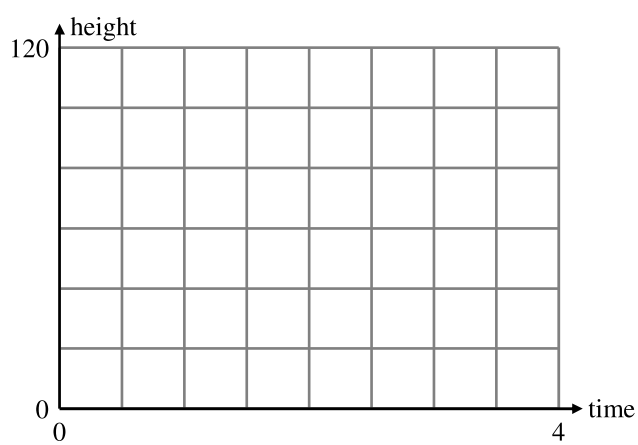
A student throws a book into the air and records the book's height as a function of time.

Time (sec)	0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Height (ft)	6.0	44.5	75.0	97.5	112.0	118.5	117	107.5	90.0	64.5	31.0

A. Find the average velocity of the book between .5 and 2.5 seconds. What does the sign of your answer tell you about the book?

B. Find the quadratic equation, $H(t) = at^2 + bt + c$, that best fits the data above. Find the values of a, b, and c. *Hint: You are not expected to do this by hand. Use your calculator and line of Best Fit function on your calculator. (If you don't know how, see the http://math.arizona.edu/~dlwood line of best fit, your instructor or use think tank.)*

C. Graph the points from [0, 4] below and show a graphical representation of your answer in part A.



D. Fill in the chart below using the equation you found in part B. At least 8 decimal places.

t(sec)	.5	.500001	.50001	.5001	.501	.6	2.5
Height(ft)							

Use the information above to complete the following table (use as many decimal places as possible): At least 8 decimal places.

Time interval	Change in time	Change in height	Average velocity
	Symbol:	Symbol:	Symbol:
	Units:	Units:	Units:
.5 to 2.5 sec			
.5 to .6 sec			
.5 to .501 sec			
.5 to .5001 sec			
.5 to .50001 sec			
.5 to .500001 sec			

E. What value do the average velocity values seem to be approaching?

What does that limiting value represent in practical terms?

What does that value represent in geometrical terms (visual representation)?
On the graph on the previous page, show visually the representation of this limiting value and label this answer with an E.

F. In general, how can you express the instantaneous rate of change of $f(x)$ at $x = a$?