INTRODUCTION TO RATES   (2.1)

1. 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 0.5 and 2.5 seconds. What does the sign of your answer tell you about the book?

B. The equation that best fits the data above is $f(t) = at^2 + bt + c$. Use the points corresponding to $t = 0, 1,$ and 2 to find the values of a, b, and c.

C. Give a graphical representation of your answer in part A.
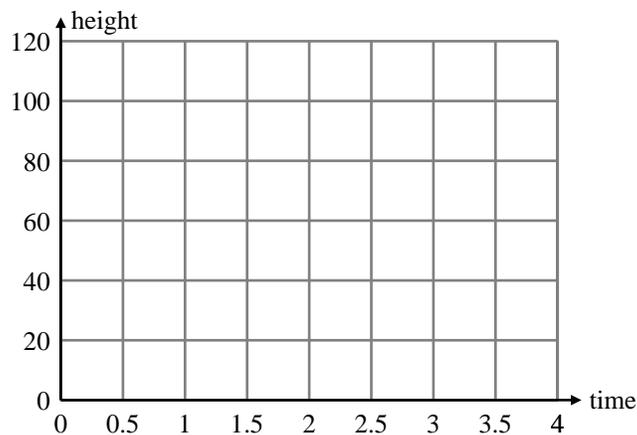
2. The following table was generated using the equation found in part B on the other side.

Time interval	Change in time	Change in height	Average velocity
	Symbol:	Symbol:	Symbol:
	Units:	Units:	Units:
0.5 to 0.6 sec	0.1	6.74	67.4
0.5 to 0.501 sec	0.001	0.06884	68.984
0.5 to 0.5001 sec	0.0001	0.00689984	68.9984
0.5 to 0.50001 sec	0.00001	0.000689985	68.99984
0.5 to 0.500001 sec	0.000001	0.00006899998	68.999984

A. Fill in the symbol and units for each column in the table.

B. What value does the change in time approach? What value does the change in height approach? What value does the average velocity approach? Express each in symbols.

C. What does the limiting value of the average velocity represent in practical terms? What does it represent in geometrical terms? Illustrate this limiting value on your graph in part C on the other side.

D. Find the equation of the tangent line to $f(t)$ at $t = 0.5$.