AP Calculus
5.2 Worksheet

All work must be shown in this course for full credit. Unsupported answers may receive NO credit.

An Activity: Instead of using LRAM and RRAM, let's introduce a "lower" and "upper" estimate to use for this example.
A lower estimate, uses the lowest *y*-value in an interval regardless of whether this point is on the left side or the right side. Similarly, an upper estimate uses the highest *y*-value in an interval.

A car is traveling so that its speed is never decreasing during a 10 – second interval. The speed at various moments in time is listed in the table below.

Time (sec)	0	2	4	6	8	10
Speed (ft/sec)	30	36	40	48	54	60

a) Explain why the best lower estimate for the distance traveled in the first 2 seconds is 60 feet.

b) Explain why the best upper estimate for the distance traveled in the first 2 seconds is 72 feet.

c) Find the best lower estimate for the distance traveled in the first 10 seconds.
♬: An answer of 300 feet (which ignores some of the data) is not correct.

d) Find the best upper estimate for the distance traveled in the first 10 seconds.
♬: An answer of 600 feet (which ignores some of the data) is not correct.

… These sums of products that you have found in *c* and *d* are called _____.

e) If you choose the lower estimate for your approximation of how far the car travels, what is the maximum amount your approximation could differ from the exact distance? … In other words, how far apart are your estimates?

f) Choose speeds to correspond with $t = 1, 3, 5, 7,$ and 9 seconds. <u>Keep the nondecreasing nature of the above table and do not select the average of the consecutive speeds</u>. Find new best upper and lower estimates for the distance traveled for these 10 seconds. … how far apart are your estimates?

Time (sec)	0	1	2	3	4	5	6	7	8	9	10
Speed (ft/sec)	30		36		40		48		54		60

New Upper Estimate: _____ New Lower Estimate: _____

g) Compare how far apart your upper and lower estimates are with at least two other groups/individuals who didn't use the same numbers as you did. What do you notice?

h) Make a prediction … How far apart do you think the estimates would be if we extended the last table to include speeds that correspond with $t = 0.5, 1.5, 2.5, 3.5, 4.5, 5.5, 6.5, 7,5, 8.5,$ and 9.5 seconds?

i) If we continue to introduce more entries into our charts, what happens to the upper and lower estimates?

h) Write an expression giving the ACTUAL distance this car traveled in 10 seconds, if it's velocity was $v(t)$.

1. Complete the following questions from your textbook: page 282 # 1 – 9 (odd), 10 – 22 (even), 23, 25, 30, 32, 37, 39, 41 - 43