Calculus 1 - Distance Traveled

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The following table gives information about the speed (velocity) of a car, measured in feet per second, as a function of time. Our goal is to estimate the distance that the car travels in the 10 seconds for which we have data.

Time	0	1	2	3	4	5	6	7	8	9	10
Velocity	20	26	30	34	38	41	44	46	48	49	50

Remember: Distance = speed × time

PART 1

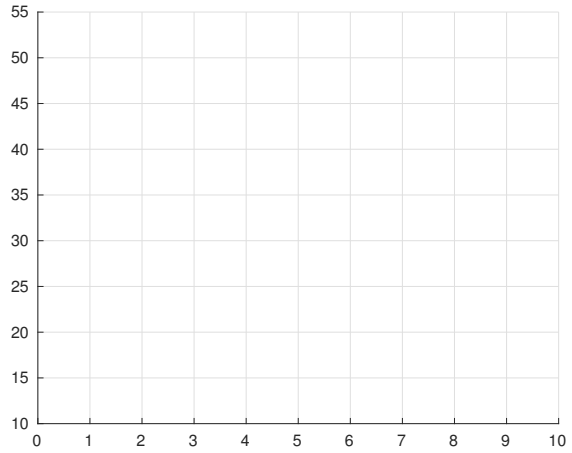
1. What if we only knew the speed at $t = 0$? How far would we say the car travels in 10 seconds?

2. What if we only knew the speed at $t = 10$? How far would we say that car had traveled in 10 seconds?

3. Why are neither of the first two calculations very accurate in predicting the real distance that the car traveled?

4. What is the difference in the two estimates? (Note - this indicates error in our calculation)

Draw a graph of the velocity vs. time that **you used** in the calculations in part 1. These should be straight flat lines!



PART 2

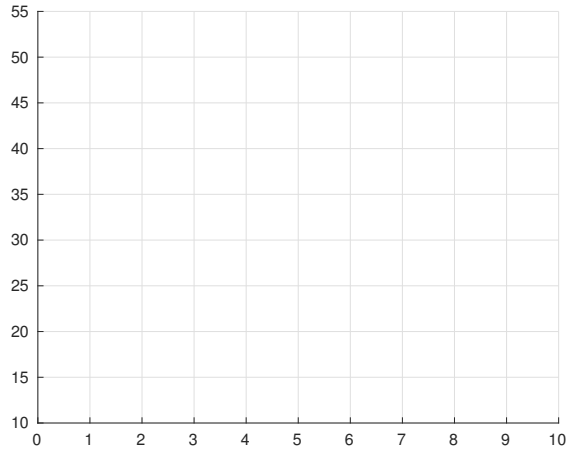
1. What if now we know the velocity at $t = 0, 5$? How would we get a better estimate for the actual distance traveled?

2. Estimate the distance traveled.

3. Is your estimate and overestimate or underestimate? Why?

4. Redo your estimate for the distance traveled assuming we know velocity at $t = 5, 10$. What is the difference in the two estimates?

Draw a graph of the velocity over time that **you used** in this calculation. Now there should be a few different straight lines used.



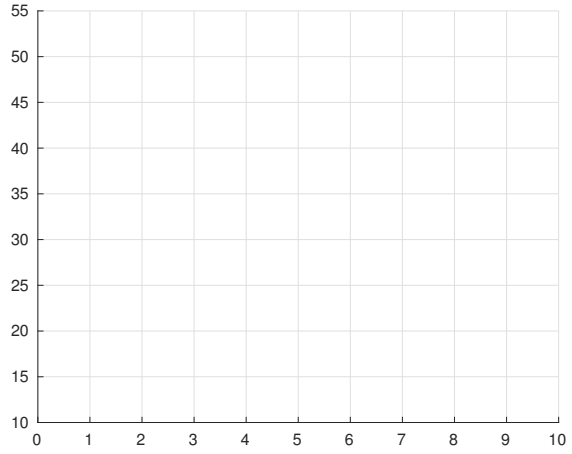
PART 3

Now using all of the given data:

1. Give an **underestimate** for the distance traveled.

2. Give and **overestimate** for the distance traveled.

Draw a graph of the velocity over time that **you used** for these calculations. One should represent how you would get an underestimate the other an over estimate.



What is the difference between your underestimate and your overestimate?

PART 4

Finally, can you propose how we might go about getting an even more accurate measure for the distance traveled?

What additional data would we need?

How could we get an exact value for the distance traveled?