Name: _____

Average Velocity & Instantaneous Velocity

Using a table of values for a position function

The table shown below represents the position of an object as a function of time. Use the table to answer the questions that follow.

Time (sec)	2.8	2.9	3.0	3.1	3.2	3.3
Position (m)	7.84	8.41	9.00	9.61	10.24	10.89

1. What is the object's position at time $t = 3$ sec? _____ At time 3.3 sec? _____

2. What is the *total change* in the object's position over the time interval from 3 to 3.3 seconds?

3. Find the *average rate of change* in the object's position over the time interval from 3 to 3.3 seconds. Show an appropriate set-up. Be sure to include UNITS in your answer.

4. By what familiar name do we refer to **average rate of change in position**?

5. Estimate the *instantaneous rate of change* in the object's position at time $t = 3$ sec. Show an appropriate set-up. Be sure to include UNITS in your answer.

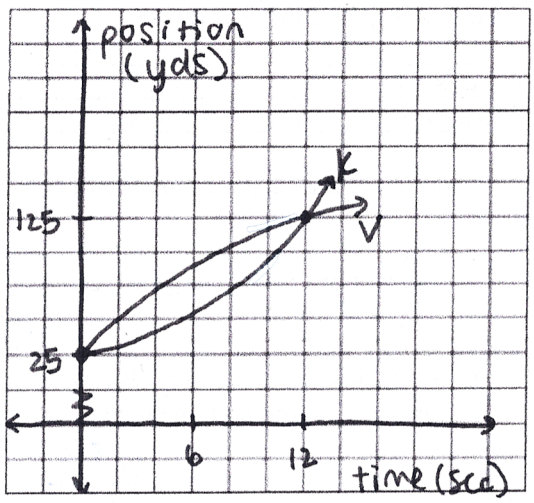
6. By what familiar name do we refer to **instantaneous rate of change of position**?

7. Find two other reasonable estimates for the object's velocity at time $t = 3$ seconds. Show your set-ups.

8. Of your three estimates for velocity at time $t = 3$, which one do you prefer? Justify.

Total change vs. average rate of change vs. instantaneous rate of change

Ms. V told Ms. K that she could beat her in a 100-yard go-kart race with her eyes closed. Ms. K took Ms. V up on the challenge. You can see below a graph of their positions during the race (position is given in yards; time is in seconds). Let $V(t)$ represent Ms. V's position graph and let $K(t)$ represent Ms. K's position graph.



1. Who won the race? Explain.

2. What is the "total change" in the V function over the first 12 seconds of the race? Give the numerical value, including units, and explain its real-world meaning.

3. Repeat question #2 for the K function.

4. What is the "average rate of change" of V over the first 12 seconds? Give a numerical value, including units, and a real-world meaning.

5. Repeat question #4 for the K function.

6. a) What does the "instantaneous rate of change" at $t = 10$ represent in real-world terms?

   b) Who has the greater instantaneous rate at $t = 10$? How can you tell?

   c) Use symbols instead of words to express you answer to the first part of question 6b.

7. Given the shapes of Ms. V's and Ms. K's position functions are so very different, how do you account for the fact that their average velocities are equal over the first 12 seconds? Say something simple and obvious if you can.