Cal Clulus: In Pursuit of Justice!
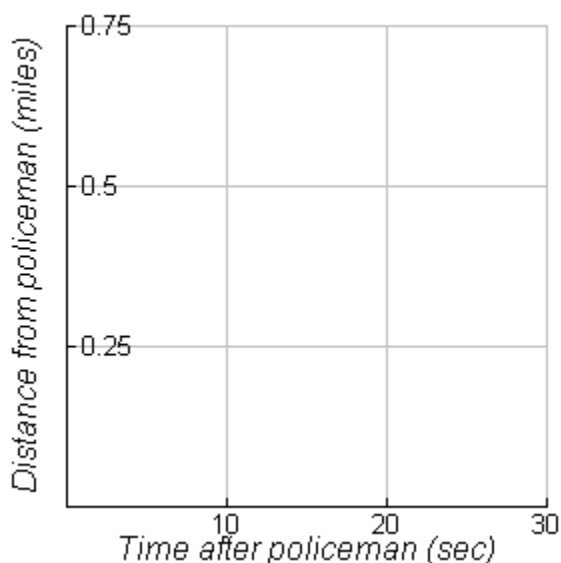
Investigative Team Member Names:

_____

_____

_____

_____

1. At _____ time the truck passed the first checkpoint and at _____ time the truck passed the second checkpoint.

2. The distance traveled between safety checkpoints according to Officer Justice was _____ miles.

3. Plot the position of the truck from the first police officer for the two check points below:

4. Connect the points and calculate the slope of the line.

5. What is the slope's unit of measure?

6. Convert your answer to miles per hour.

7. Interpret the meaning of the speed you calculated in #6 in the context of the truck.
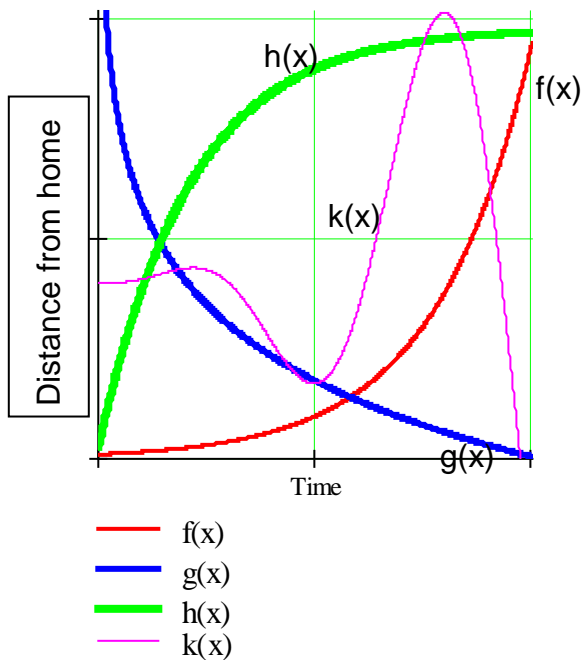
8. If the posted speed limit on the road was 45 miles per hour, what can you say about the truck's speed. Explain.

9. In question 4, you drew a line segment connecting the two points. Do you think that the truck's distance actually increased in *a linear fashion* from the first checkpoint to the second checkpoint? Explain why or why not.

10. Sketch a graph of distance versus time for the truck using the ideas you used in questions 4 - 7. Put the graph on the grid below along with the linear graph from question 4. (Make one graph darker than the other in order to distinguish between the two.)

11. On the new graph you drew in question #8 above, sketch a tangent line (or lines if there is more than one possible line) (a line that touches the curve in only one place) to the curve that is parallel to the original line in question #3.

12. The **secant line** (a line that intersects the graph at two points) represents the _____ rate of change of the truck.

13. The **tangent line (s)** (a line that intersects the graph at only one point) represents the _____ rate of change of the truck.

14. In a few sentences describe the speed of the truck between the checkpoints according to how you drew your graph in question #10.
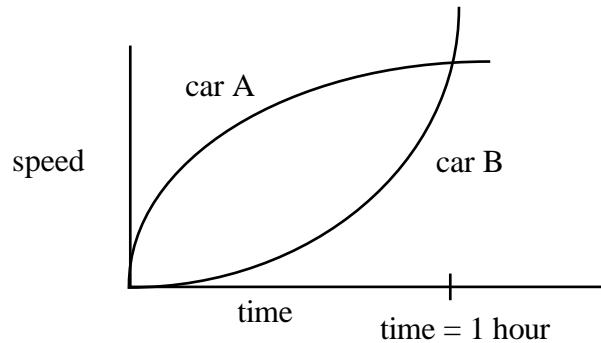
Homework:

1. If a car traveled 50 miles in 2 hours, how fast was the car traveling during this 2-hour period? What does this speed tell about the car?

2. Must the car travel the speed calculated in #1 above for the entire 2 hours? Explain.

3. Describe in words, the **_distance traveled_** of each object graphed above.

4. Describe in words, the **_speed_** and direction of each object graphed above.
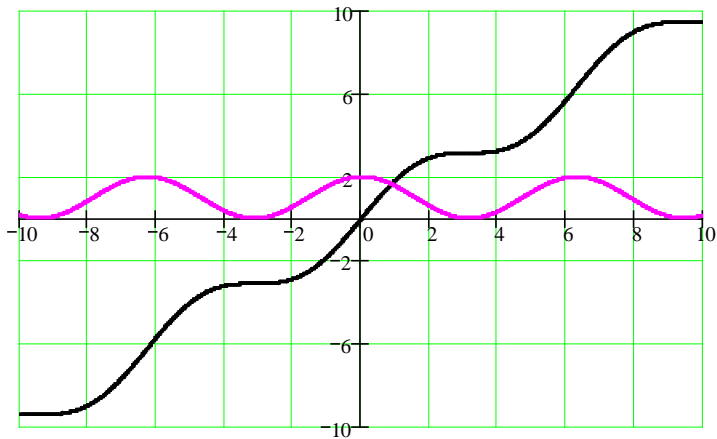
The given graph represents **_speed vs. time_** for two cars. (Assume the cars start from the same position and are traveling in the same direction.) Use this information and the graph below to answer 5 - 8.

5.   What is the relationship between the **position** of car A and car B at $t = 1$ hr.?

6.   What is the relationship between the **speed** of car A and car B at $t = 1$ hr.?

7.   State the relationship between the **acceleration** of car A and car B at $t = 1$ hr.

8.   What is the relative **position** of the two cars during the time interval between $t = .75$ hr. and $t = 1$ hr.? (i.e. Is one car pulling away from the other?)

9. Imagine being the defense attorney for the driver of the truck in the Cal Clulus episode. Your job is to try and get the driver released from a criminal speeding charge in any way you can because you are being paid a lot of **money**. Show using <u>both</u> a table and a graph of distance values vs. time that **_theoretically_** it is possible to be driving 42 MPH at the first police officer, 43 MPH at the second police officer, average 60 MPH, but **<u>NEVER</u>** go 65 MPH or over (and be criminal speeding).

10. For the two functions below, determine which function is f (x) and which function is
    f ' (x). Justify your answer.

10. Draw a continuous, non-constant function, f(x), that has an average rate of change
    from x = -2 to x = 7 equal to the instantaneous rate of change at x = 0 and x = 4. Also,
    make f(8) = -3 and f(x) = 0 at x = 4 and x = 9.