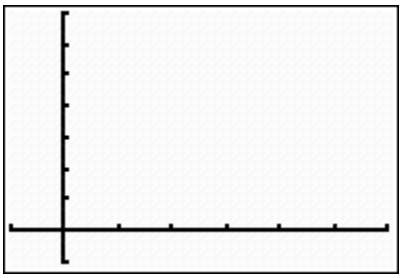
A Preview of Calculus Name: _____

The distance from Denver to Pueblo is approximately 120 miles.

If I make this trip at a CONSTANT VELOCITY, and it takes me 2 hours, how fast am I travelling? _____
Can this situation possibly happen? _____ Why or why not?

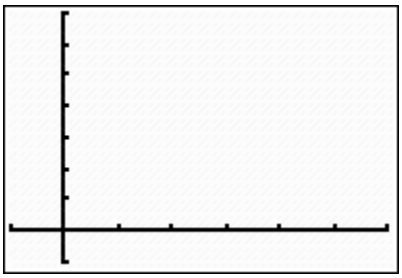
Sketch a graph of my distance traveled vs. time below. Be sure to label your axes.



What is the equation of the distance vs. time graph above? _____ Show your work below.

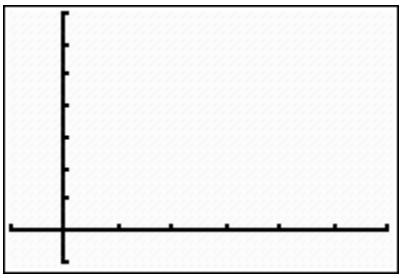
Is there another way to find this equation? Explain.

What would the graph of the velocity vs. time graph look like? Sketch it below.

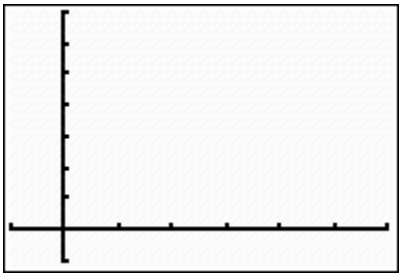


It is easy to see that the slope of the distance vs. time graph is the height of the constant function for the velocity vs. time graph. But, an interesting question is, "how could the velocity vs. time graph tell the distanced I traveled on the trip?" How might you go about finding the answer to this question?

My Second Trip to Pueblo: Suppose, during another trip from Denver to Pueblo, after an hour of driving, I decide to stop for lunch. Lunch takes me an hour to eat and then I am back on my way. Assume that during the first and third hour of my trip I am again traveling at a CONSTANT RATE of 60 miles per hour. Sketch a graph of this distance vs. time graph, and create a rule for the equation.



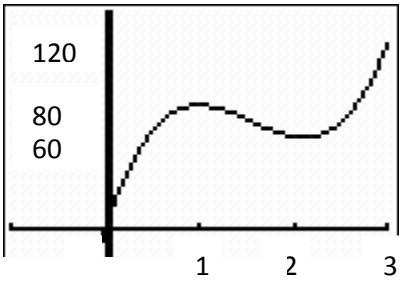
What would the graph of this velocity vs. time graph look like? Sketch it below.



Use the velocity vs. time graph to find the total distance traveled _____ Explain.

My Third Trip to Pueblo:

Suppose the distance vs. time graph for my trip from Denver to Pueblo looks like the curve shown below.



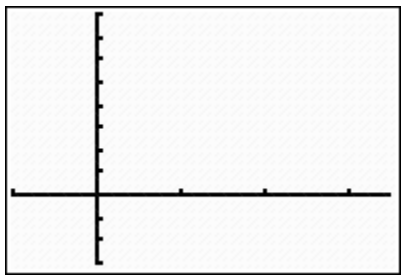
The graph above is the graph of a POSITION FUNCTION. What does this graph indicate about my trip?

The velocity vs. time graph is now a bit more complicated!
Are there any times during the trip when my velocity is zero? _____if so, when?

Is it possible for the velocity to be negative? _____ Explain.

What is true about the graph when I am traveling the fastest?

Use the results of the above questions to attempt to graph a velocity vs. time graph below.



How could this graph be used to find the total distance traveled for the 3 hour, 120 mile trip?

If you were only given the velocity graph, would you be able to draw the distance graph? _____What does the velocity graph tell you about the distance graph?

What type of function does the distance vs. time graph in the last Denver to Pueblo trip look like? _____

The graph appears to contain the ordered pairs (0, 0), (1, _____), (2, _____), (3, _____).

Enter these ordered pairs in the STATISTICS EDITOR of your calculator and create a scatterplot.

Perform a cubic regression on the data (from STAT, CALC, 6: CubicReg) to find the function D(t), which models my position at any time t. Record the regression equation below and graph it to see how it fits the data:

D(t) = _____

To find out how well a graph fits the data you can use a CORRELATION COEFFICIENT:

- Turn your DIAGNOSTICS on → 2^{ND}, 0 (CATALOG) → Scroll down to the "d's" until you find DiagnosticOn (when you are in the catalog, the alpha mode is automatically turned on, so you can also hit the x^{-1} button (which is D) and then scroll down). Hit enter. "DiagnosticOn" will appear on your home screen.
- Redo the cubic regression, and you will see an R^2 value. The closer the R^2 is to 1, the better the regression graph fits the data. If it equals one, it fits the data perfectly.

How well does the graph fit the data?

Use the distance vs. time function to answer the following:

1. How far from my starting point am I after 1.5 hours? _____
2. How could I calculate my "average rate of change" of my position/distance with respect to time during the first hour of my trip? Calculate this value and explain.

   How else could you describe this value? _____

3. What was my average velocity over the second hour of my trip? _____ Show your work below.

4. What was my average velocity from t=2.2 to t=2.8 hours?

In Calculus, the question will move from "What is my average velocity from 2.5 hours to 2.7 hours" to "How fast am I going at EXACTLY 2.5 hours?"