Calculus Laboratory 4:
The Fundamental Theorem of Calculus

We are going to investigate the speed function s(t) from your previous laboratories. Use a spreadsheet to complete a table of values for t, s(t), A(t), and A'(t) based on the following criteria. t will be 25 equal increments (h) from 0 to the ending time of the trip. s(t) will be the values of your speed function at each t. A(t) represents the area under s(t) from 0 to t. Finally, to find A'(t), use the approximation formula: $A'(t) = [A(t + h) - A(t)]/h$. All columns of your spreadsheet should use formulas and these formulas should be printed as well as the values.

Using the chart function (graph), plot the points for s(t) and A'(t) on the same graph with s(t). What did you notice? How can you express this relationship that you found? Use this relationship to find a formula for A'(t). Does the formula give you the same values for A'(t) as the computer? Why or why not? (Hint: Think FTIC.) Discuss.

Use a curve fit program (delta or cricket) and find another formula for A'(t) by plugging in the values from your table for t and A'(t). Both allow the copy/paste option. Obtain a hard copy of the data, formula and graph.

Use graphing software to graph your original function for s(t) and your new function for A'(t) on the same axes. Describe the results.

Interpret the function A(t) in terms of the trip from Bloomington to Nashville. Use a graph to overlay s(t) with A(t). Explain why this interpretation makes sense. Be sure to use the proper units.

Find the length of Heidi's velocity function and give any significance to this value to Heidi.

Heidi has a special garden that needs to be filled with topsoil. Find Heidi's garden and using calculus methodology, calculate exactly how much dirt Heidi needs. Be sure to be very clear about your strategy because Heidi is counting on you.

Find Heidi's gas tank capacity and estimated MPG for **her** car. How much gas did she use and at today's rate, how much did she pay? How fast was gas leaving the tank of her car when she was 10 feet from the streetlight from project #3?

Prepare a creative presentation with visuals to share with the class. Discuss this with other teams and make your presentation unique to this project.

See the calendar for due date. Presentations will be on that day.