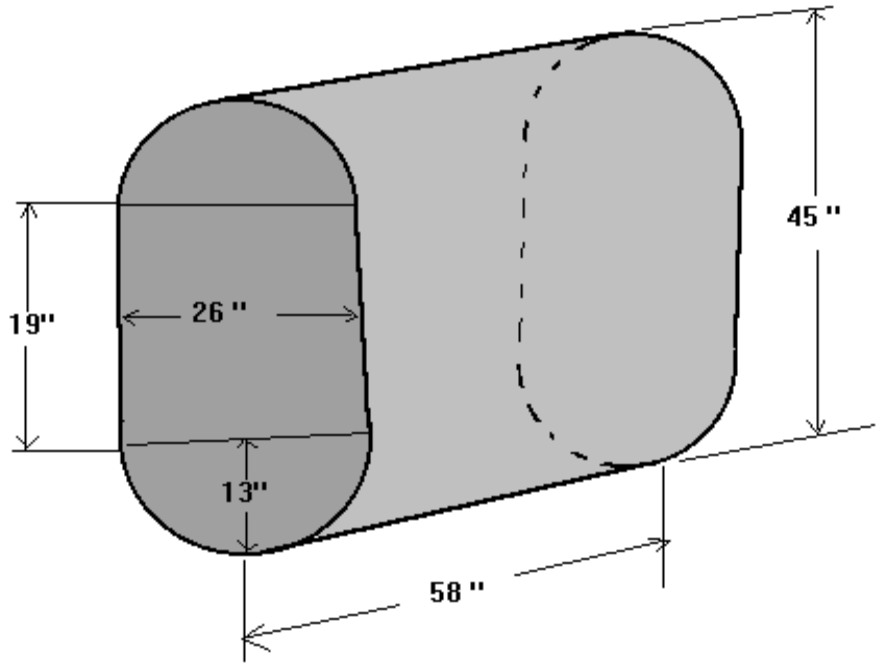
Project 1 - OILS WELL THAT ENDS WELL!

Introduction: In this project you will use integral calculus to design a measuring stick for the very common 260 gallon oil tank with dimensions shown below. You will calculate the gallons for each inch of the measuring stick. Note that the stick is placed into the top of the tank, like an oil dipstick in an automobile.



Part I - Due in 1 week (10 Points)

1. Find the equation that defines a cross-section (viewed from the end) of the semi-circular bottom portion of the tank, where the origin of the coordinate axis is at the bottom of the tank.

2. Find an integral for the volume (in^3) of the bottom of the semi-circular portion. Remember that volume of a regular solid is equal to the cross-sectional area times the length of the solid. Integrate with respect to y and use integration limits of y=0 to y=h, where h is the height of the oil.

3. Multiply the integral found in step 2 by the appropriate conversion factors to convert the cubic inches into gallons. Show the integral that results in gallons for each inch in the bottom semi-circular portion of the tank.

SEE NEXT PAGE FOR PART II

Part II - Due in 2 weeks (15 points)

1. Evaluate the integral for values of h = 1 through 13. This represents the first 13 inches of your dip stick. Suggestion: Use the TI-85 to evaluate the integral. Press 2nd Enter to bring up the previous calculation and change the upper limit of integration.

2. Calculate the volume of each inch "slab" of the rectangular solid mid-section of the tank. Using this calculation, find the gallons for each of the inch-levels from h=14" to h=32".

3. Use the data from question 1 above to complete all 45 of the inch-levels for the remaining 13 inches of the dipstick. Note: At 45 inches, you should be close to 260 gallons!

Inches	Gallons		Inches	Gallons		Inches	Gallons

4. Describe a method for calibrating this dipstick without using calculus.