

**ALL STUDENTS MUST TURN IN THEIR OWN WORK. You must also cite any borrowed work (with the exception of the textbook).** Since everyone has their own project, you should not work together, but rather, ask clarifying questions.

In this project you will be assessed on the following priority standards.

- PS 7 – Solve problems using the derivative analytically, graphically, numerically, and verbally for a variety of problems (including optimization, related rates, and rectilinear motion).
- PS 9 – Solve problems including those that model area, volume and surface area.

You will be demonstrating your understanding of **applying calculus to real world problems** and **showing your knowledge of implicit differentiation** when solving **related rates** problems.

### **Task Description:**

1. Choose two related rates problems to write a full report about. These should be from the provided examples and *may not be the same problems as other students*. You may choose your problem on a first come, first serve basis.
  - a. To earn full credit, your two problems **must include** two of the four features below:
    - i. Area of two-dimensional surface
    - ii. Volume of a three-dimensional space
    - iii. Surface Area of a three-dimensional object
    - iv. Angles requiring the use of trigonometric functions.
2. Your report must include:
  - a. A written description of the problem you are trying to solve.
  - b. CLEAR question your problem is working to answer (i.e. What is the speed that the top of the ladder is falling when the ladder is 3 feet from the ground?).
  - c. Any formulas used to solve the problem (area, volume, surface area, Pythagorean Theorem, angles, etc.)
  - d. Clear description of **all variables and derivatives and their units** used to solve the problem and values you know as part of the problem (using the table may help).
  - e. A calculus appropriate picture of the problem you are trying to solve (including any measurements including units and variables you know or are working to solve).
  - f. The correct answer to your question proposed and **all mathematical work leading to that answer**.
  - g. A paragraph summary statement of the problem and answer in context written so a Geometry student could understand the setup and the meaning of the solution.
3. Grade your own project according to the Rubric based on what you think. You can go back and edit your project if you realized you missed something.

## **Timeline**

- March 8/11 – Project introduction & initial problem selection
- March 12/13 – In class project work time, come prepared next class for feedback from Mr. Germanis
- March 14/15 – Project Feedback Day. Come prepared next class with a short 2-minute presentation of your work to the class.
- March 18/19 – Paper Projects Due by 2:05pm (or emailed [rgermani@fwps.org](mailto:rgermani@fwps.org) by 9pm if absent).
  - Be sure to submit a self-evaluation rubric with your project.

Name: \_\_\_\_\_

Place an X in the box that best represents the quality of that element in the project as a whole.

Standard	Description	1 Never Present	2 Sometimes Present	3 Regularly Present	4 Always present
PS 7 - Solve problems using the derivative analytically, graphically, numerically, and verbally for a variety of problems (including optimization, related rates, and rectilinear motion).  <b>Overall Score:</b> _____	Student presents a well written question and interprets the problem for the reader.				
	Student uses implicit differentiation to solve the problem.				
	Picture provided aids any reader in better understanding the question being asked. Values and variables are labeled in the picture.				
	Student interprets the answer for the reader and puts numbers into usable meanings.				
PS9 - Solve problems including those that model area, volume and surface area.  <b>Overall Score:</b> _____	Students have 2 of the 4 required types of related rates problems.				
	Student demonstrates understanding of formulas needed to solve the problem.				
	Student demonstrates understanding of variables used.				
	Student correctly answers the question showing all work leading to the answer.				

Project Template for each related rate problem

Name: \_\_\_\_\_

Problem Description:	Picture:
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Question your problem will answer:

Formula's used in your problem (area, volume, etc.):

Variables & Constants:

Descriptors	Variables/Symbols	Values (if known)	Units

Problem Workspace:

The answer to the question being asked above (in context):

Summary paragraph of the problem and answer in context:

Attach a self-evaluated rubric for BOTH of your problems (meaning you will have one rubric for the two problems you submit. You should edit your project if it does not meet all of the criteria.