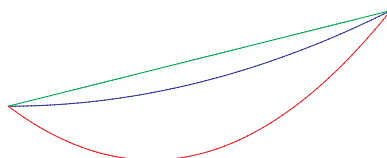


Varying surface area (a Maple-assisted project)

You know how to compute the surface area of a frustum of a cone, which is a surface of revolution obtained by revolving a line segment about an axis. In this project you will investigate the variation of the surface area with respect to the surface.

Consider a family of positive functions whose graphs all have the same endpoints as each other.



axis of revolution (x -axis)

The basic question to be answered is, “How small can the surface area of the corresponding surfaces of revolution be, and which function generates the surface with the smallest area?”

This is a somewhat open-ended problem. Here are some specific questions to focus your investigation.

1. When does a piece of a parabola do better than a line segment? What is the best parabola?
2. What is the best cubic polynomial?
3. Can you analyze some other classes of functions? (For example, how about pieces of trigonometric graphs or pieces of exponential graphs?)
4. What is the best general function you can find? Do you think you have found *the* best function? Why?
5. How do your results depend on the initial line segment? For instance, do the results change qualitatively if you change the length or the slope of the starting line segment?

Due date

This project will count as part of your lab grade (along with the quizzes). The project is due at your Thursday recitation meeting on **December 5**.

Here are the teams for the project. Each team will write a report on the results of its researches.

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