

# Getting Out of Prism

Graphing Equations  
Linear/Quadratic  
Solving Equations  
Surface Area  
Volume

**Standards:** Problem Solving, Communication, Reasoning, Algebra, Functions, and Geometry from an Algebraic Perspective.

**Materials:** CFX-9850G or CFX-9850Ga PLUS

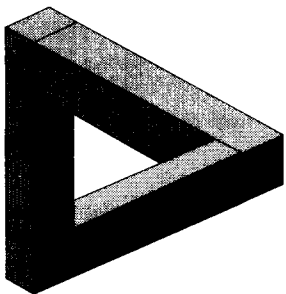
**Calculator Menus:** RUN and GRAPH

## Finding Roots

In the GRAPH Menu  
Graph the equation,  
Press F5 (G-Solv)  
F1 (ROOT)  
Press the right arrow for the  
next root.

## Helpful Idea

It would be helpful to get a  
right triangular based prism  
or construct one out of  
paper for this activity.



One "fancy" name for a box is right rectangular based prism. The "right" is important because it tells that all sides (faces) are perpendicular to the bases. "Rectangular based" indicates that both bases are congruent rectangles. A right equilateral triangle based prism would have congruent equilateral triangles as bases and all faces would be congruent rectangles.

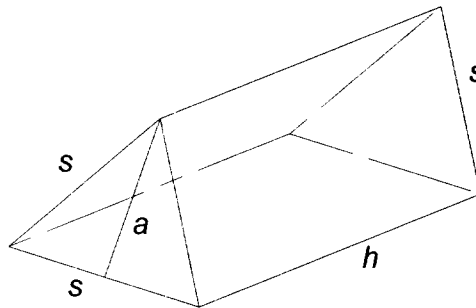


Figure 1

Figure 1 shows a right equilateral triangle based prism (referred to as a prism from here on) with the side of the equilateral triangle base as "s", the altitude of the triangle as "a", and the length or height of the rectangle face of the prism as "h".

What is the altitude of the triangle forming the base of the prism? **A.** \_\_\_\_\_

What is the area of the triangle forming the base of the prism? **B.** \_\_\_\_\_

What is the area of one face of the prism? **C.** \_\_\_\_\_

What is the total surface area of the prism? **D.** \_\_\_\_\_

Suppose the side of the triangle is assigned some value and the height of the face is still expressed as a variable. What would the graph of this arrangement look like? **E.** \_\_\_\_\_

Make  $s = 3$  and graph  $\frac{(s^2\sqrt{3})}{2} + 3sh$  which is the total surface area of the prism.

Express "h" as "X" in your formula and graph. Was your answer to **E** correct? **F.**

## Getting Out of Prism

### Setting the V-Window to the Initial Setting (INIT).

Press SHIFT key  
F3 (V-Window)  
F1 (INIT)  
EXIT key

? represents a high level question

### Setting the V-Window to Standard Setting (STD)

Press SHIFT key  
F3 (V-Window)  
F3 (STD)  
EXIT key

### Resizing the Graph Window

Press Shift key  
F3 (V-WIN)  
Highlight Xmin, Xmax, Ymin, or Ymax.  
Enter desired value  
EXE key  
Repeat steps to alter min or max values for X or Y.

This activity is adapted from a work by Bonnie H. Litwiller and David R. Duncan as found in the Spring/Summer Connecticut Mathematics Journal.

Does it make sense to have this graph outside the first quadrant as shown in Figure 2? Why or why not? **G.**

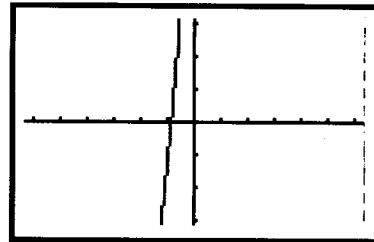


Figure 2

Suppose the height of the prism is assigned some value and the length of the side of the triangle or width of the face is expressed as a variable. What would the graph of this arrangement look like? **H.**

Make  $h = 4$  and graph  $\frac{(s^2\sqrt{3})}{2} + 3hs$  which is the total surface area of the prism.

Set the V-Window so  $-18 \leq X \leq 5$  and  $-45 \leq Y \leq 20$ . Express "s" as "X" in your formula and graph. Was your answer to **H** correct? **I.**

Does it make sense to have this graph outside the first quadrant? Why or why not? **J.**

? Interpret the meaning of the graph passing through the origin. **K.**

Suppose the total surface area was 20 square units, giving  $20 = \frac{(s^2\sqrt{3})}{2} + 3sh$ .

This too can be graphed by solving for "h" and letting "s" = X. Describe the graph with the V-Window set in the STD mode. **L.**

Find the roots when the total surface area of the prism is fixed at 20 square units. **M.** \_\_\_\_\_

In this instance, there are two roots. Do they both make sense? Why or why not? **N.**

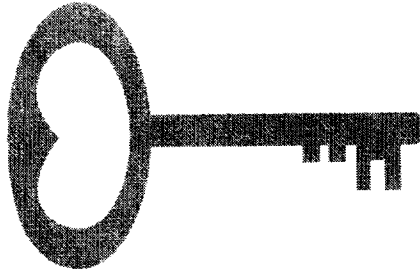
What is the volume of the prism in Figure 1? **O.** \_\_\_\_\_

Suppose the side of the triangle is assigned some value and the height of the face is still expressed as a variable. What would the graph of the volume with this arrangement look like? **P.**

Suppose the height of the prism is assigned some value and the length of the side of the triangle or width of the face is expressed as a variable. What would the graph of the volume with this arrangement look like? **Q.**

Suppose the volume is fixed at some value. What will the graph of the resultant situation look like? **R.**

# Solution Key



---

## Getting Out of Prism

- A.**  $\frac{s\sqrt{3}}{2}$       **B.**  $\frac{s^2\sqrt{3}}{4}$       **C.**  $hs$       **D.**  $\frac{s^2\sqrt{3}}{2} + 3hs$
- E.** Answers will vary. Should be linear.      **F.** Answers will vary.
- G.** No. Outside the first quadrant indicates negative side lengths.
- H.** Answers will vary. Should be a parabola.      **I.** Answers will vary.
- J.** No. Outside the first quadrant indicates negative side lengths.
- K.** At the origin, area of the base goes to zero. A line, the height of the prism, is left. But the line has no area.
- L.** The graph has 2 parts, both of which approach the X-axis as an asymptote.
- M.** -4.8056228282 and 4.8056228282.      **N.** No because the negative root indicates a negative area.
- O.**  $\frac{hs^2\sqrt{3}}{4}$
- P.** Answers will vary. Should be linear.      **Q.** Answers will vary. Should be a parabola.
- R.** The curve is asymptotic to both the X-axis and positive Y-axis. Since the volume is constant, it must be the case that as one dimension increases, the other must decrease.