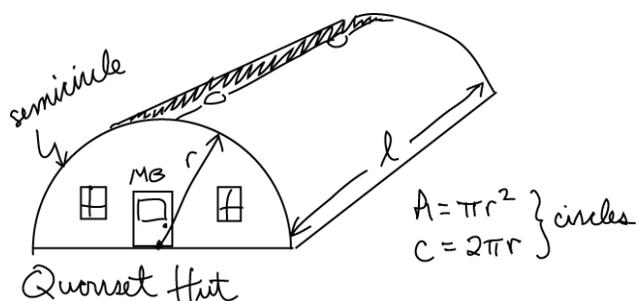
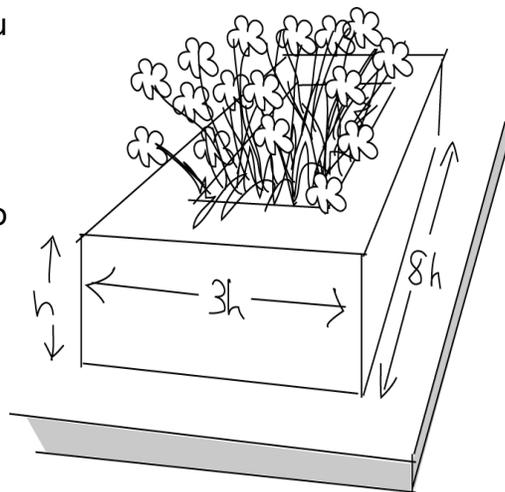


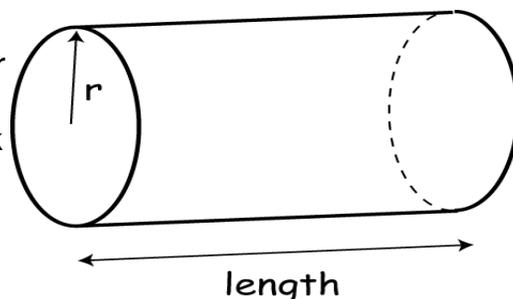
Applications of Polynomial Functions

1. You are designing a stone planter for a city park. You want the length of the planter to be eight times its height, and the width to be three times the height. The sides need to be 1 foot thick to act as a bench. It does not need a bottom, and will be filled with soil. Calculate the outer dimensions of the planter if it is to hold 90 cubic feet of soil.

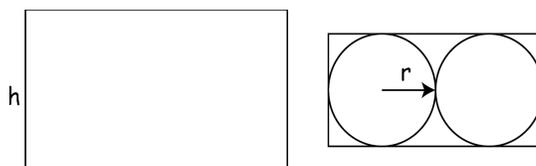


2. A Quonset hut is a building shaped like half a cylinder. It's an easy structure to build for temporary housing. Let's say you have 1000 sq. ft. of material to build a Quonset hut. Find the maximum volume of such a hut with a surface area of 1000 sq. ft. Ignore the windows and doors.

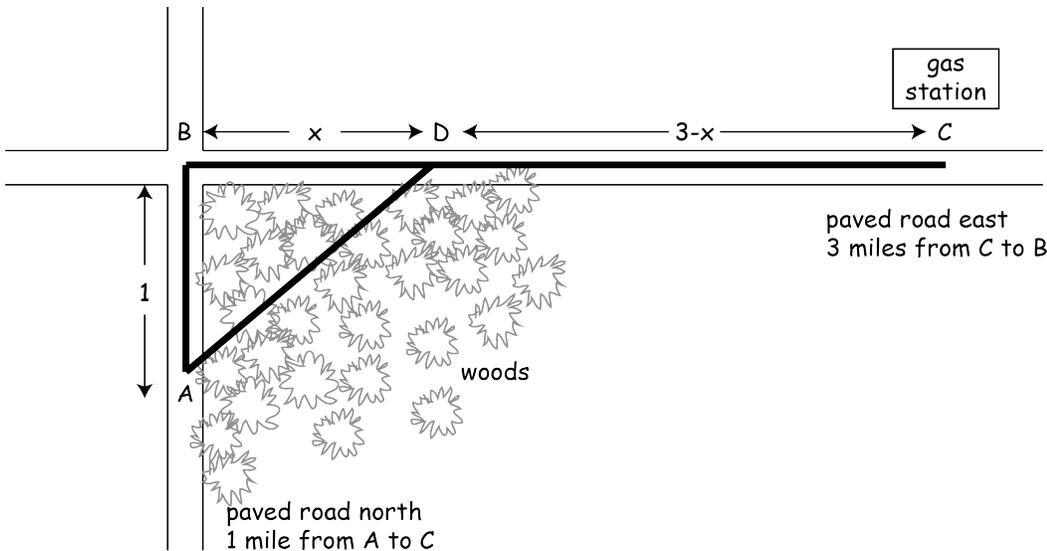
3. An underground storage tank is to be designed to use 600 sq. ft. of sheet steel to construct it. In other words, the total surface area of the tank must be 600 ft.². Find the maximum volume that such a tank can have.



4. A manufacturer receives an order for oil cans that are to have a capacity of 1000 cm³. Each can is made from a rectangular sheet of metal by rolling the sheet into a cylinder. The lids are stamped out from another rectangular sheet, as shown. What are the most economical proportions of the can? (Economy, in this sense, would be the can that uses the least metal. Note that stamping out the circles always creates some waste).



5. An orchard owner has statistical records showing that if 25 apple trees are planted, each tree yields 500 apples (on average), while the yield decreases about 10 apples per tree for each additional tree planted. How many trees should be planted for maximum total yield?
6. A wire of a given length can be used to make a circle or a square, or can be cut into two pieces to make both a circle and a square.
- How much of the wire should be used for the circle if the total enclosed area is to be a minimum?
 - What if the enclosed area is to be a maximum?
7. Debbie and Laurie are out of gas at A in the figure below. Each thinks about how to reach the gas station at C in the shortest possible time and then they set out simultaneously. Each is capable of hiking 3 mph through the woods and jogging 5 mph on the road.
- Debbie decides to hike through the woods to some point D on the road, and then jog on the road east to C. Find the location of D to minimize her time. Recall that time = distance/rate.
 - Who will get to the gas station first?



8. A rectangular playground is to be placed inside an elliptical track. The equation for the ellipse is $x^2/100 + y^2/100 = 1$. Find the greatest area of such a playground.