3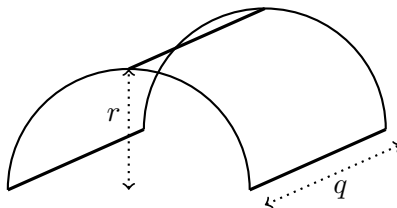. [9 points] Duncan's person is making him a new tent in the shape of half a cylinder. She plans to use wire to make the tent frame. This will consist of two semicircles of radius r (measured in inches) attached to three pieces of wire of length q (also measured in inches), as shown in the diagram below. She has 72 inches of wire to use for this.

a. [4 points] Find a formula for r in terms of q.

Answer: $r =$ _____

b. [2 points] Let $V(q)$ be the volume (in cubic inches) of the space inside the tent after the fabric is added, given that the total length of wire is 72 inches and the length of the tent is q inches. (Recall that the tent shape is half of a cylinder.) Find a formula for $V(q)$. The variable r should <u>not</u> appear in your answer.
(Note: This is the function that Duncan's person would use to find the value of q that maximizes the volume of the tent, but you should not do the optimization in this case.)
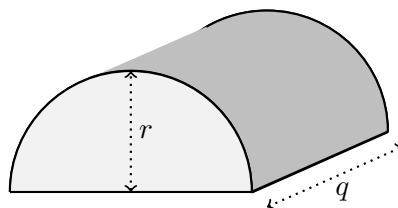
Answer: $V(q) =$ _____

c. [3 points] In the context of this problem, what is the domain of $V(q)$?

Answer: _____