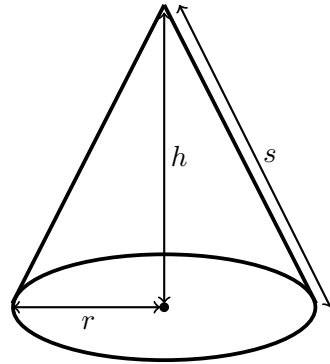


3. [10 points] Jane is designing a water tank using a cone of height  $h$  meters and a circular base of radius  $r$  meters as shown below.



$r$  = radius  
 $h$  = height  
 $s$  = length of slant side

- a. [4 points] The cost of the material for the tank is 3 dollars per square meter for the circular base and 5 dollars per square meter for the cone (without the base). The area,  $A$ , of the material used for the cone (without the base) is given by the formula  $A = \pi r s$  where  $s$  is the length of the slant side of the cone, in meters. Find a formula for  $s$  in terms of the radius  $r$  if Jane plans to spend 200 dollars on the water tank. *Your answer should not include the variable  $h$ .*

$$s = \underline{\hspace{10em}}$$

- b. [2 points] In the context of this problem, what are appropriate constraints on  $r$  and/or  $s$ ? Choose the one best answer.

$$0 < r < \infty \quad 0 < r < s \quad 0 < r < \sqrt{\frac{200}{3\pi}} \quad 0 < s < r \quad 0 < r < \sqrt{\frac{200}{5\pi}}$$

- c. [4 points] Find a formula for  $V(r)$ , the volume of the tank (in cubic meters) in terms of the radius  $r$ . Recall that the volume of a cone with radius  $R$  and height  $H$  is  $\frac{1}{3}\pi R^2 H$ . *Your answer should not include the variables  $h$  and/or  $s$ .*

$$V(r) = \underline{\hspace{10em}}$$