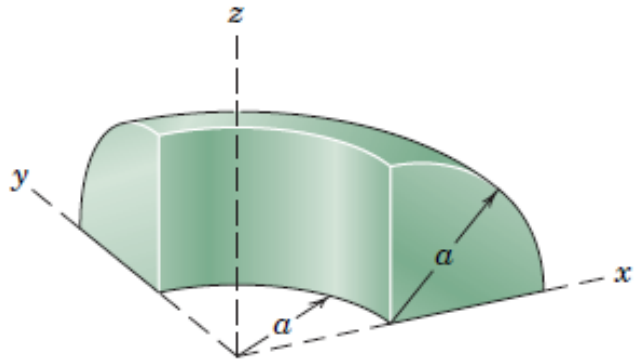


New Problem Sheet No. 5.3
(Theorems of Pappus)

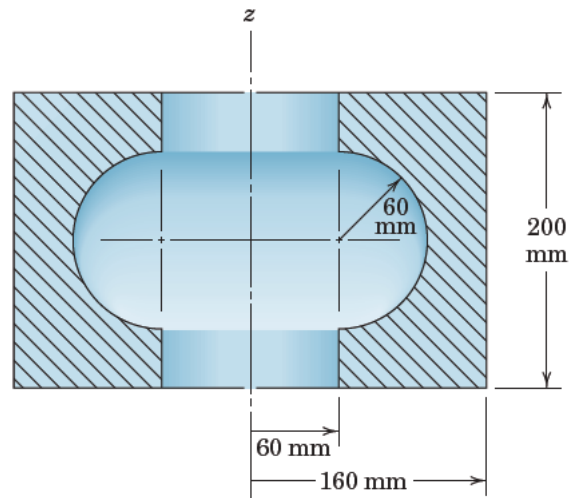
1. Determine the volume V generated by revolving the quarter-circular area about the z -axis through an angle of 90° .

$$Ans. V = \frac{\pi a^3}{12} (3\pi - 2)$$



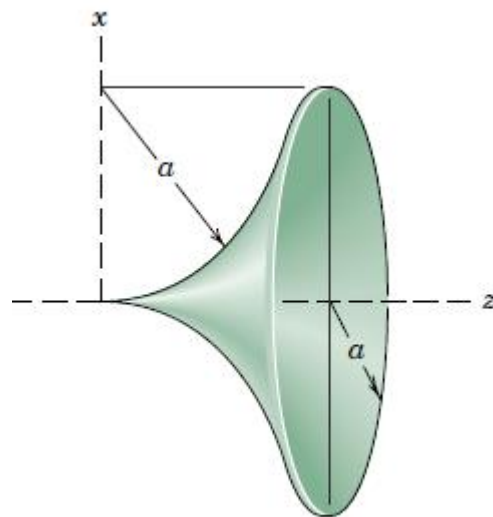
2. A steel die, shown in section, has the form of a solid generated by revolving the shaded area around the z -axis. Calculate the mass m of the die.

$$Ans. \bar{m} = 84.5 \text{ kg}$$



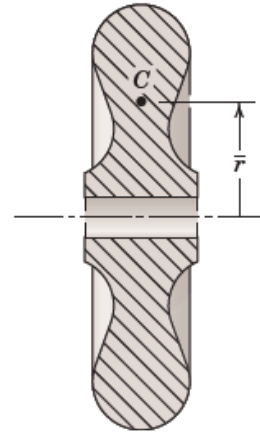
3. Determine the volume within the bell-shaped shell shown.

$$Ans. V = \frac{\pi a^3}{6} (10 - 3\pi)$$



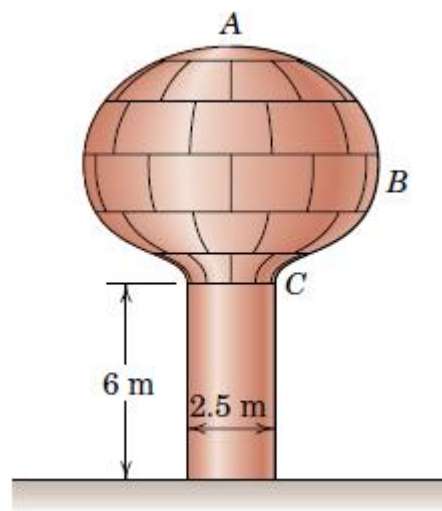
4. A hand-operated control wheel made of aluminium has the proportions shown in the cross-sectional view. The area of the total section shown is $15\,200\text{ mm}^2$, and the wheel has a mass of 10.0 kg . Calculate the distance \bar{r} to the centroid of the half-section. The aluminium has a density of 2.69 Mg/m^3 .

Ans. $\bar{r} = 77.8\text{ mm}$



5. The water storage tank is a shell of revolution and is to be sprayed with two coats of paint which has a coverage of 16 m^2 per liter. The engineer (who remembers mechanics) consults a scale drawing of the tank and determines that the curved line ABC has a length of 10 m and that its centroid is 2.50 m from the centerline of the tank. How many liters of paint will be used for the tank including the vertical column?

Ans. 25.5 liters



6. Compute the volume V of the solid generated by revolving the right triangle about z -axis through 180° .

Ans. $V = 3619\text{ mm}^3$

