Optimization: Maximum Volume of a Cylinder

Practice Worksheet (Jan 2023 Paper 1H Style)

I Do

The radius of a right circular cylinder is x cm. The height of the cylinder is $\left(\frac{800}{\pi x} - x\right)$ cm. The volume of the cylinder is V cm^3. Find the maximum value of V, giving your answer correct to the nearest whole number.

We Do

The radius of a right circular cylinder is x cm.

The height of the cylinder is $\left(\frac{540}{\pi x} - x\right)$ cm.

The volume of the cylinder is V cm^3.

Find the maximum value of V, giving your answer correct to the nearest whole number.

You Do

The radius of a right circular cylinder is x cm.

The height of the cylinder is $\left(\frac{300}{\pi x} - x\right)$ cm.

The volume of the cylinder is V cm^3.

Find the maximum value of V, giving your answer correct to the nearest whole number.

Challenge

The radius of a right circular cylinder is x cm.

The height of the cylinder is $\left(\frac{1200}{\pi x} - 2x\right)$ cm.

The volume of the cylinder is V cm^3.

Find the maximum value of V, giving your answer correct to the nearest whole number.

Answers

- **I Do:** $x = \sqrt{\frac{800}{3\pi}}$; $V_{\max} = 2464$.
- **We Do:** $x = \sqrt{\frac{180}{\pi}}$; $V_{\max} = 2725$.
- **You Do:** $x = \sqrt{\frac{100}{\pi}}$; $V_{\max} = 1128$.
- **Challenge:** $x = \sqrt{\frac{200}{\pi}}$; $V_{\max} = 6383$.