The KQ cola company wants to use as little aluminum per can of cola as possible for a 355 cm^3 cylindrical can.

What this problem is really asking for is the minimum surface area for the can.

So we are trying to minimize this function:

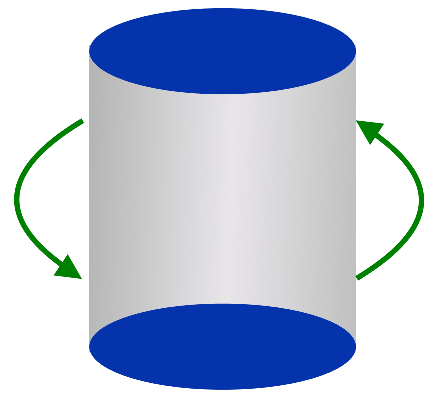
$$A = \underbrace{2\pi r^2}_{\text{area of circular ends}} + \underbrace{2\pi r h}_{\text{lateral area}}$$

We need to eliminate one of these variables through substitution

Since we also know that

$$V = 355cm^3 = \pi r^2 h$$

$$\frac{355}{\pi r^2} = h$$



$$A = 2\pi r^2 + 2\pi r \frac{355}{\pi r^2}$$

$$A = 2\pi r^2 + \frac{710}{r}$$

Since we're trying to minimize the area the only domain restriction here is that $r > 0$

Now let's differentiate

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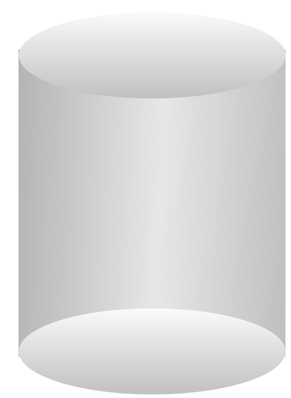

So we are trying to minimize this function:

Now let's differentiate

$$A = 2\pi r^2 + \frac{710}{r}$$

$$A' = 4\pi r - \frac{710}{r^2} = 0$$

$$4\pi r = \frac{710}{r^2}$$

$$r^3 = \frac{355}{2\pi}$$

$$r = \sqrt[3]{\frac{355}{2\pi}}$$

$$r \approx 3.837\,cm$$

A sign pattern of the derivative confirms that it represents a minimum value for *A*

A'	0	$-$	0	$+$	→
r	0		3.837		

$$h \approx 7.674\,cm$$

So the minimum area possible is:

$$A \approx 277.545\,cm^2$$