

A can of dog food contains 500 cm^3 of food. The manufacturer, wanting to make sure that the company received maximum profits, would like to make sure that the surface area of the can was as small as possible. Let the radius of the can be r cm and the height, h cm.

- a** Find an expression for the surface area S in terms of r .
- b** Find $\frac{dS}{dr}$.
- c** Hence, find the dimensions of the can that will have the minimum surface area.

A large tank in the shape of a cuboid is to be made from 54 m^2 of sheet metal. The tank has a horizontal base and no top. The height of the tank is x metres. Two opposite vertical faces are squares.

- a** Show that the volume, $V \text{ m}^3$, of the tank is given by $V = 18x - \frac{2}{3}x^3$
- b** Given that x can vary, use differentiation to find the maximum or minimum value of V .
- c** Justify that the value of V you have found is a maximum.