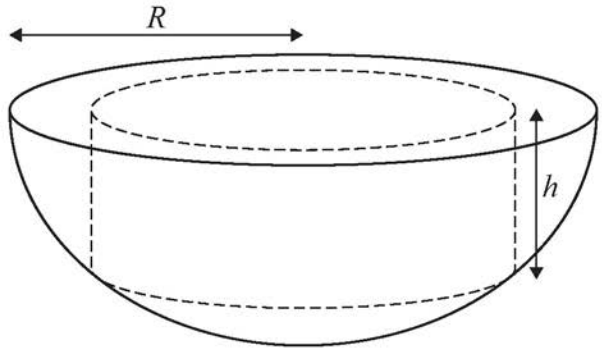
9 A cylinder is to be cut out of the circular face of a solid hemisphere.

The cylinder and the hemisphere have the same axis of symmetry.

The cylinder has height h and the hemisphere has a radius of R.



9 (a) Show that the volume, V, of the cylinder is given by

$$V = \pi R^2 h - \pi h^3$$

[3 marks]

9 (b) Find the maximum volume of the cylinder in terms of R.

Fully justify your answer.

[7 marks]