

CALCULUS OPTION (Q 8, PAPER 2)

1998

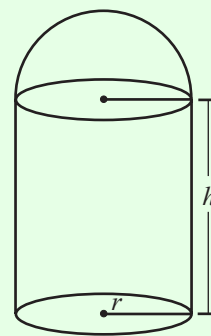
8 (a) Use the ratio test to show that $\sum_{n=1}^{\infty} \frac{n}{2^n}$ is convergent.

(b) Evaluate $\int_0^{\frac{\pi}{2}} x^2 \cos x dx$.

(c) A tank with a base is made from thin uniform metal. The tank standing on level ground is in the shape of an upright circular cylinder and hemispherical top with radius of length r metres. The height of the cylinder is h metres.

(i) If the total surface area of the tank is $45\pi \text{ m}^2$, express h in terms of r .

(ii) Find the value of h and of r for which the tank has maximum volume.



ANSWERS

8 (b) $\frac{1}{4}\pi^2 - 2$

(c) (i) $h = \frac{45}{2r} - \frac{3r}{2}$ (ii) $r = h = 3 \text{ m}$