ZCA 110 Kalkulus dan Aljabar

Semester I, Sessi 2005/06
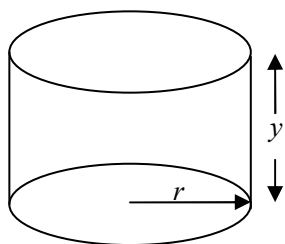
QUIZ 3 (4 August 2005)

Nama:

No. Kad Matriks:

Kumpulan Tutorial:

Q1 Consider the total surface area of a closed-ended right cylinder of radius r and height y. If the total surface is fixed, what is the ratio of r to y that gives $\dfrac{dV}{dr} = 0$? Show you working steps.

Solution: modified from SP 10, pg 101   [total 6 marks]

$$S = 2\pi r^2 + 2\pi r y, V = \pi r^2 y \qquad \text{(1 marks)}$$

$$\frac{dS}{dr} = 2\pi \cdot 2r + 2\pi\left[y + r\frac{dy}{dr}\right] \qquad \text{(1 marks)}$$

$$\text{set } \frac{dS}{dr} = 0 \qquad \text{(1 marks)}$$

$$\Rightarrow 2r = -\left(y + r\frac{dy}{dr}\right)$$

$$\frac{dy}{dr} = \frac{-2r - y}{r} = -2 - \frac{y}{r} \qquad \text{(1 marks)}$$

$$\frac{dV}{dr} = \pi\frac{d}{dr}\left(r^2 y\right) = \pi\left(2ry + r^2\frac{dy}{dr}\right) = \pi\left[2ry + r^2\left(-2 - \frac{y}{r}\right)\right] \qquad \text{(1 marks)}$$

$$\text{set } \frac{dV}{dr} = 0 \Rightarrow 2yr = \left(2 + \frac{y}{r}\right)r^2$$

$$\therefore \frac{y}{r} = 2 \qquad (1 \text{ mark})$$