

P2 CHAPTER QUIZ - Differentiation

Questions

Q1.

The curve C has equation

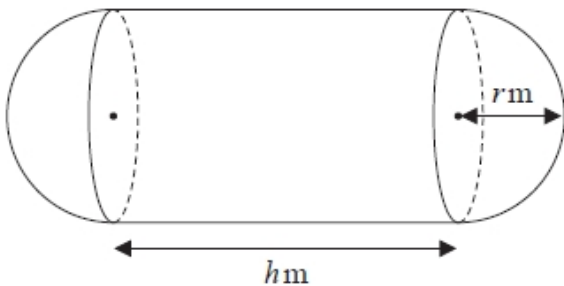
$$y = 12x^{\frac{5}{4}} - \frac{5}{18}x^2 - 1000, \quad x > 0$$

- (a) Find $\frac{dy}{dx}$ (2)
- (b) Hence find the coordinates of the stationary point on C. (5)
- (c) Use $\frac{d^2y}{dx^2}$ to determine the nature of this stationary point. (3)
- (d) Use $\frac{dy}{dx}$ to find the interval where the function is increasing. (2)

(Total for question = 12 marks)

Q2.

[A sphere of radius r has volume $\frac{4}{3}\pi r^3$ and surface area $4\pi r^2$]



A manufacturer wishes to produce a storage tank.

The tank is modelled in the shape of a hollow circular cylinder with a hemispherical shell at each end, as shown in Figure 4.

The walls of the tank are assumed to have negligible thickness.

The cylinder has radius r metres and length h metres and each hemisphere has radius r metres.

The volume of the tank will be 5 m^3 .

- (a) Show that, according to the model, the surface area of the tank $A \text{ m}^2$ is given by $A = \frac{10}{r} + \frac{4}{3}\pi r^2$ (4)

The manufacturer wishes to find the minimum value of A .

- (b) Find the value of A when $\frac{dA}{dr} = 0$ (6)
- (c) Justify, by further differentiation, that the value of A found in part (b) is a minimum. (2)

For the minimum value of A ,

- (d) find the value of h . (2)

(Total for question = 14 marks)