

- 8 (a) The curve  $y = \frac{1}{(1+x^2)^2}$  is shown in Fig. 8.

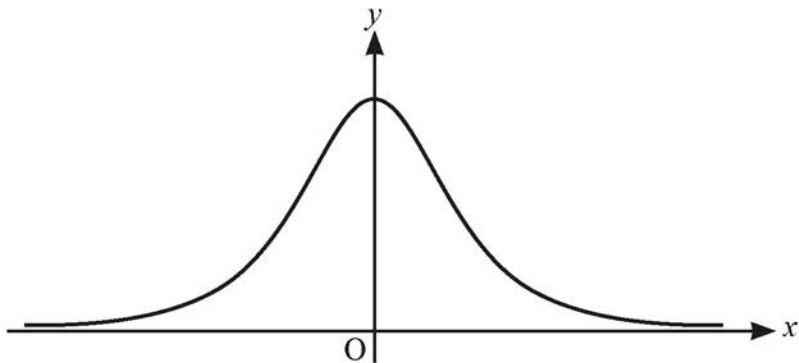


Fig. 8

(i) Show that  $\frac{d^2y}{dx^2} = \frac{20x^2 - 4}{(1+x^2)^4}$ . [5]

(ii) In this question you must show detailed reasoning.

Find the set of values of  $x$  for which the curve is concave downwards. [3]

(b) Use the substitution  $x = \tan \theta$  to find the exact value of  $\int_{-1}^1 \frac{1}{(1+x^2)^2} dx$ . [8]