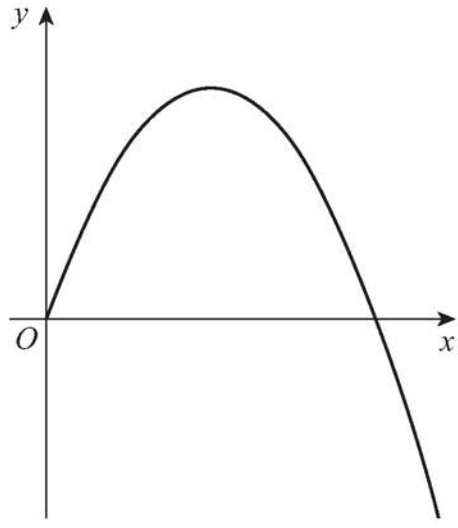
14 The curve C is defined for $t \geq 0$ by the parametric equations

$$x = t^2 + t \quad \text{and} \quad y = 4t^2 - t^3$$

C is shown in the diagram below.



14 (a) Find the gradient of C at the point where it intersects the positive x-axis.

[5 marks]

14 (b) (i) The area A enclosed between C and the x-axis is given by

$$A = \int_0^b y \, \mathrm{d}x$$

Find the value of b.

[1 mark]

14 (b) (ii) Use the substitution $y = 4t^2 - t^3$ to show that

$$A = \int_0^4 (4t^2 + 7t^3 - 2t^4) \, \mathrm{d}t$$

[3 marks]

14 (b) (iii) Find the value of A.

[1 mark]