1   Find $\int \left(3x^5 + 2x^{-\frac{1}{2}}\right) dx$.   **[4]**
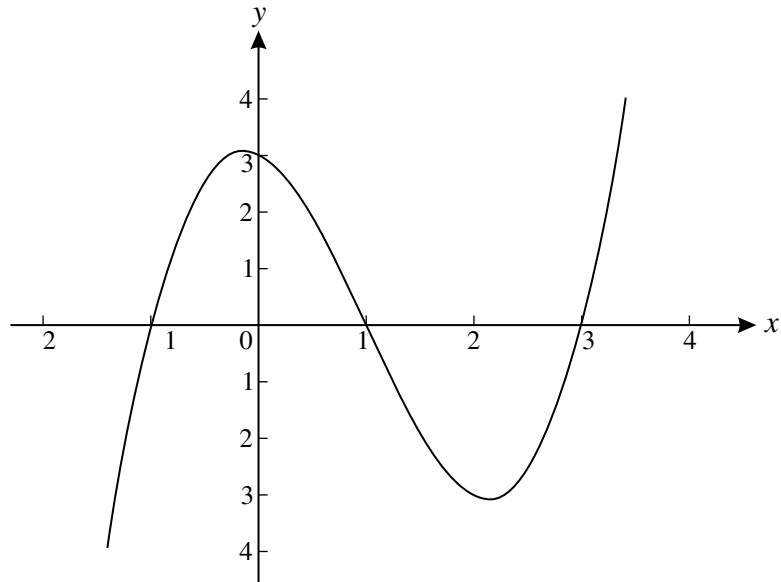
2

Fig. 11

Fig. 11 shows the curve $y = x^3 - 3x^2 - x + 3$.

   (i) Use calculus to find $\int_1^3 (x^3 - 3x^2 - x + 3)\, dx$ and state what this represents.   **[6]**

  (ii) Find the x-coordinates of the turning points of the curve $y = x^3 - 3x^2 - x + 3$, giving your answers in surd form. Hence state the set of values of x for which $y = x^3 - 3x^2 - x + 3$ is a decreasing function.   **[5]**

3   Find $\int \left(x - \dfrac{3}{x^2}\right) dx$.   **[3]**

4 Find $\int \left(20x^4 + 6x^{-\frac{3}{2}}\right) dx.$ **[4]**

5 Find $\int \left(12x^5 + \sqrt[3]{x} + 7\right) dx.$ **[5]**

6 Find $\int \left(x^{\frac{1}{2}} + \dfrac{6}{x^3}\right) dx.$ **[5]**

7 Find $\int \left(x^3 + \dfrac{1}{x^3}\right) dx.$ **[4]**

8 **(i)** Differentiate $12\sqrt[3]{x}$.   **[2]**

    (ii) Integrate $\dfrac{6}{x^3}$.   **[3]**