Differentiation [Ch. 5]

1 Differentiate $x^3 + x^{\frac{1}{2}}$ with respect to x. [2]

2 Given that $f(x) = 3x^2 - 5x - 2$, find $f'(x)$. [2]

3 It is given that $f(x) = 2x^3 - x^2 + x^{\frac{3}{2}} + 5$.

(i) Find $f'(x)$. [3]

(ii) Find the gradient of the curve $y = f(x)$ at the point where $x = 4$. [2]

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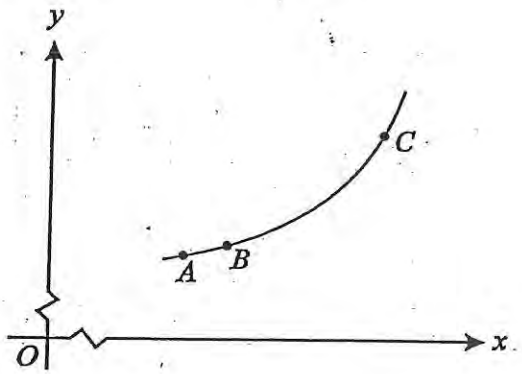

The diagram shows a sketch of part of the curve $y = x^3 + 3$. The points A, B and C lie on the curve and have x-coordinates 2, 2.01 and 2.1 respectively.

(i) Find the exact value of the gradient of the chord AC. [2]

(ii) Find the exact value of the gradient of the chord AB. [1]

(iii) Explain how your answers to parts (i) and (ii) relate to the gradient of the curve $y = x^3 + 3$ at A. [2]

5 (i) Given that $y = x(x^2 + 4)$, find $\frac{dy}{dx}$. [2]

(ii) Hence find the equation of the tangent to the curve $y = x(x^2 + 4)$ at the point whose x-coordinate is 1. Give your answer in the form $y = mx + c$. [3]

(iii) The normal to the curve $y = x^3 + ax$ at the point with coordinates $(2, b)$ has gradient $\frac{1}{2}$. Find the values of the constants a and b. [6]

6 (i) Find the equation of the tangent to the curve $y = x^2 + 4x + 3$ at the point whose x-coordinate is 1. Give your answer in the form $y = mx + c$. [5]

The line $y = 4x + k$ is a tangent to the curve $y = x^2 + 4x + 3$ at a point P.

(ii) Find the value of k. [4]

(iii) Find an equation of the normal to the curve $y = x^2 + 4x + 3$ at the point P. [3]