Differentiation

(i) Given that $y = 5x^3 + 7x + 3$, find

(a) $\frac{dy}{dx}$,

(3)

(b) $\frac{d^2y}{dx^2}$.

(1)

Given that $y = 6x - \frac{4}{x^2}$, $x \neq 0$,

(a) find $\frac{dy}{dx}$,

(2)

(b) find $\int y \, dx$.

(3)

Given that $y = 2x^2 - \frac{6}{x^3}$, $x \neq 0$,

(a) find $\frac{dy}{dx}$,

(2)

(b) find $\int y \, dx$.

(3)

Differentiate with respect to x

(a) $x^4 + 6\sqrt{x}$,

(3)

(b) $\frac{(x+4)^2}{x}$.

(4)

Given that

$$y = 4x^3 - 1 + 2x^{\frac{1}{2}}, \quad x > 0,$$

find $\frac{dy}{dx}$.

(4)

Given that $y = 3x^2 + 4\sqrt{x}, \quad x > 0$, find

(*a*) $\frac{dy}{dx}$,

(2)

(*b*) $\frac{d^2y}{dx^2}$,

(2)

(a) Write $\frac{2\sqrt{x}+3}{x}$ in the form $2x^p + 3x^q$, where p and q are constants.

(2)

Given that $y = 5x - 7 + \frac{2\sqrt{x}+3}{x}, \quad x > 0$,

(*b*) find $\frac{dy}{dx}$, simplifying the coefficient of each term.

(4)

$$f(x) = 3x + x^3, \qquad x > 0.$$

(*a*) Differentiate to find $f'(x)$.

(2)

Given that $f'(x) = 15$,

(*b*) find the value of x.

(3)

Given that $\frac{2x^2 - x^{\frac{3}{2}}}{\sqrt{x}}$ can be written in the form $2x^p - x^q$,

(*a*) write down the value of p and the value of q.

(2)

Given that $y = 5x^4 - 3 + \frac{2x^2 - x^{\frac{3}{2}}}{\sqrt{x}}$,

(*b*) find $\frac{dy}{dx}$, simplifying the coefficient of each term.

(4)

Given that $y = 2x^3 + \frac{3}{x^2}$, $x \neq 0$, find

(*a*) $\frac{dy}{dx}$, **(3)**

$$f(x) = \frac{(3 - 4\sqrt{x})^2}{\sqrt{x}}, \quad x > 0.$$

(*a*) Show that $f(x) = 9x^{-\frac{1}{2}} + Ax^{\frac{1}{2}} + B$, where A and B are constants to be found. **(3)**

(*b*) Find $f'(x)$. **(3)**

(*c*) Evaluate $f'(9)$. **(2)**

Given that $y = x^4 + x^{\frac{1}{3}} + 3$, find $\frac{dy}{dx}$. **(3)**

Given that

$$y = 8x^3 - 4\sqrt{x} + \frac{3x^2 + 2}{x}, \qquad x > 0,$$

find $\frac{dy}{dx}$. **(6)**

The curve C has equation

$$y = \frac{1}{2}x^3 - 9x^{\frac{3}{2}} + \frac{8}{x} + 30, \qquad x > 0.$$

(*a*) Find $\frac{dy}{dx}$. **(4)**

Given that $y = 2x^5 + 7 + \frac{1}{x^3}$, $x \neq 0$, find, in their simplest form,

(*a*) $\frac{dy}{dx}$, **(3)**

(*b*) $\int y \, dx$. **(4)**