

# Basic Differentiation 2

5.

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

(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)

**(Total 8 marks)**

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6.

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

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

(4)

**(Total 6 marks)**

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

- (a) Differentiate to find  $f'(x)$ . (2)

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

- (b) find the value of  $x$ . (3)
- (Total 5 marks)**
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8. The curve  $C$  has equation  $y = kx^3 - x^2 + x - 5$ , where  $k$  is a constant.

- (a) Find  $\frac{dy}{dx}$ . (2)

The point  $A$  with  $x$ -coordinate  $-\frac{1}{2}$  lies on  $C$ . The tangent to  $C$  at  $A$  is parallel to the line with equation  $2y - 7x + 1 = 0$ .

Find

- (b) the value of  $k$ , (4)
- (c) the value of the  $y$ -coordinate of  $A$ . (2)
- (Total 8 marks)**
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9. (a) Write  $\frac{2\sqrt{x} + 3}{x}$  in the form  $2x^p + 3x^q$  where  $p$  and  $q$  are constants. (2)

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

- (b) find  $\frac{dy}{dx}$ , simplifying the coefficient of each term. (4)
- (Total 6 marks)**
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