

Differentiation

(4) Find $\frac{dy}{dx}$ for each of the following.

(i) $y = 6$

$$\frac{dy}{dx} = 0$$

(ii) $y = 5x$

$$\frac{dy}{dx} = 5(1)x^{1-1}$$

$$= 5$$

(iii) $y = -3x^4$

$$\frac{dy}{dx} = -3(4)x^{4-1}$$

$$= -12x^3$$

(iv) $y = \frac{5}{x}$

$$= 5x^{-1}$$

$$\frac{dy}{dx} = 5(-1)x^{-1-1}$$

$$= -5x^{-2}$$

$$= -\frac{5}{x^2}$$

(v) $y = \frac{-2}{3x^3}$

$$= -\frac{2}{3} (x^{-3})$$

$$= -\frac{2}{3} (-3) x^{-3-1}$$

$$= 2x^{-4}$$

(b) Differentiate each of the following functions.

(i) $y = -8x^4 - 3x + 5$

$$\frac{dy}{dx} = -8(4)x^{4-1} - 3(1)x^{1-1}$$

$$= -32x^3 - 3x$$

$$= -32x^3 - 3 \quad \#$$

(ii) $y = \frac{1}{x^3} + 4x^2 - 3x - 1$

$$= x^{-3} + 4x^2 - 3x - 1$$

$$\frac{dy}{dx} = -3x^{-3-1} + 4(2)x^{2-1} - 3(1)x^{1-1}$$

$$= -3x^{-4} + 8x - 3$$

$$= -3 \left(\frac{1}{x^4} \right) + 8x - 3$$

$$= \frac{-3}{x^4} + 8x - 3$$

(iii) $y = 5 - 2x + 3x^2 - \frac{1}{x}$

$$= 5 - 2x + 3x^2 - x^{-1}$$

$$\frac{dy}{dx} = -2(1)x^{1-1} + 3(2)x^{2-1} - (-1)x^{-1-1}$$

$$= -2x^0 + 6x + x^{-2}$$

$$= -2x^0 + 6x + \frac{1}{x^2} \quad \#$$

(C) Determine the differentiation for the following functions. $x = y$ (v)

$$(i) y = x(2x)$$

$$= 2x^2$$

$$\frac{dy}{dx} = 2(2)x^{2-1}$$

$$= 4x$$

$$(ii) y = x(3x+2)$$

$$= 3x^2 + 2x$$

$$\frac{dy}{dx} = 3(2)x^{2-1} + 2(1)x^{1-1}$$

$$= 6x + 2$$

$$(iii) y = -x(2-x)$$

$$= -2x + x^2$$

$$\frac{dy}{dx} = -2(1)x^{1-1} + 2x^{2-1}$$

$$= -2x + 2x \quad \#$$

$$(iv) y = \frac{3x^2 + 2x - 1}{x^2}$$

$$= \frac{3x^2}{x^2} + \frac{2x}{x^2} - \frac{1}{x^2}$$

$$= 3 + \frac{2}{x} - \frac{1}{x^2}$$

$$= 3 + 2x^{-1} - x^{-2}$$

$$\frac{dy}{dx} = 3(-1)x^{-1-1} - (-2)x^{-2-1}$$

$$= -2x^{-2} + 2x^{-3}$$

$$= -2x\left(\frac{1}{x^2}\right) + 2\left(\frac{1}{x^3}\right)$$

$$= -\frac{2}{x^2} + \frac{2}{x^3} \quad \#$$

$$(v) \quad y = \frac{x(x-2)}{3}$$

$$= \frac{x^2 - 2x}{3}$$

$$= \frac{x^2}{3} - \frac{2x}{3}$$

$$\frac{dy}{dx} = \frac{1}{3} x^2 - \frac{2}{3} x$$

$$= \frac{1}{3} (2) x^{2-1} - \frac{2}{3} (1) x^{1-1}$$

$$= \frac{2}{3} x - \frac{2}{3}$$

$$(xc) x = y \quad (i)$$

$$x^2 c =$$

$$1-x^2 x(c) c = \frac{pb}{xb}$$

$$x^2 c =$$

$$(4+x^2) x = y \quad (ii)$$

$$x^2 c + x c =$$

$$x(1) c + 1-x^2 x(c) c = \frac{pb}{xb}$$

$$x + x^2 c =$$

$$(x-x) x = y \quad (iii)$$

$$x^2 c + x c =$$

$$1-x^2 x(c) + 1-x^2 x(c) c = \frac{pb}{xb}$$

$$x + x^2 c =$$

$$1-x^2 x(c) + x^2 c = y \quad (iv)$$

$$x^2 c =$$

$$1-x^2 x(c) + x^2 c =$$

$$1-x^2 x(c) + x^2 c =$$

$$1-x^2 x(c) + x^2 c =$$

$$1-x^2 x(c) + x^2 c = \frac{pb}{xb}$$

$$x^2 c + x^2 c =$$

$$\left(\frac{1}{x^2} \right) c + \left(\frac{1}{x^2} \right) x^2 c =$$

$$x^2 c + x^2 c =$$

Group 4

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Question 7.

C2. a(i) $y = 3$

$\frac{dy}{dx} = 0$

(ii) $y = x^3$

$\frac{dy}{dx} = 3(1)x^{3-1}$
 $= 3x^2$

(iii) $y = \frac{2}{x} = 2x^{-1}$

$\frac{dy}{dx} = 2(-1)x^{-1-1}$

$= -2x^{-2}$

$= -2\left(\frac{1}{x^2}\right)$

$= \frac{-2}{x^2}$

b(i) $y = 7x^2 + 3$

$\frac{dy}{dx} = 7(2)x^{2-1} + 0$

$= 14x$

(ii) $y = \frac{2}{x^5} + 2x^2 - 3x$

$y = 2x^{-5} + 2x^2 - 3x$

$\frac{dy}{dx} = 2(-5)x^{-5-1} + 2(2)x^{2-1} - 3(1)x^{1-1}$

$= -10x^{-6} + 4x - 3x^0$

$= -10\left(\frac{1}{x^6}\right) + 4x - 3x^0$

$= \frac{-10}{x^6} + 4x - 3$

C3 (i) $y = x(5 - 3x^2)$

$= 5x - 3x^3$

$y = 5x - 3x^3$

$\frac{dy}{dx} = 5(1)x^{1-1} - 3(3)x^{3-1}$

$= 5x^0 - 9x^2$

$= 5 - 9x^2$

(ii) $y = \frac{6x^3 + 4x^2 - 3x}{x^2}$

$= \frac{6x^3}{x^2} + \frac{4x^2}{x^2} - \frac{3x}{x^2}$

$= 6x + 4 - \frac{3}{x}$

$\frac{dy}{dx} = 6(1)x^{1-1} + 0 - 3(-1)x^{-1-1}$

$= 6x^0 + 0 - 3x^{-2}$

$= 6x^0 + 0 - 3\left(\frac{1}{x^2}\right)$

$= 6 + -\frac{3}{x^2}$