EX.4. $\dfrac{x+y}{x-y} = 2$

$$\dfrac{(x-y)(1+y') - (x+y)(1-y')}{(x-y)^2} = 0$$

$$\dfrac{x + xy' - y - yy' - x + xy' - y + yy'}{(x-y)^2} = 0$$

$$\dfrac{-2y + 2xy'}{(x-y)^2} = 0$$

$$-2y + 2xy' = 0$$

$$2xy' = 2y$$

$$\therefore y' = \dfrac{y}{x}$$

⑤

8 - قاعدة السلسلة ; Chain Rule

EX.1. $y = x^2$, $x = 2t + 1$, Find dy/dt

$$\dfrac{dy}{dx} = 2x \quad , \quad \dfrac{dx}{dt} = 2$$

$$\dfrac{dy}{dt} = \dfrac{dy}{dx} \cdot \dfrac{dx}{dt}$$

$$= (2x)\cdot(2) = 4x$$

EX.2. $y = 2x^2 + 3x - 1$, $x = 3t - \dfrac{1}{t}$, $t = s^2 + s - 1$, Find $\dfrac{dy}{ds}$

$$\dfrac{dy}{ds} = \dfrac{dy}{dx} \cdot \dfrac{dx}{dt} \cdot \dfrac{dt}{ds}$$

$$\dfrac{dy}{dx} = 4x + 3$$

$$\dfrac{dx}{dt} = 3 + \dfrac{1}{t^2}$$

$$\dfrac{dt}{ds} = 2s + 1$$

$$\therefore \dfrac{dy}{ds} = (4x+3)\left(3 + \dfrac{1}{t^2}\right)(2s+1)$$

④

EX.3. $y = 5t - 2$; $x = 3t^2 + 2t + 1$, Find $\dfrac{dy}{dx}$

$$\frac{dy}{dt} = 5$$

$$\frac{dx}{dt} = 6t + 2$$

$$\frac{dy}{dx} = \frac{\dfrac{dy}{dt}}{\dfrac{dx}{dt}} = \frac{5}{(6t + 2)}$$

_____

problems

A: Find dy/dx of the fallowing: —

1) $y = (x^3 - 2x^2 + x - 1)^5$

2) $y = (x^2 + x + 1)^4 \cdot (x^2 - 2x - 5)^3$

3) $y = \dfrac{(x^2 + 2)}{(x^2 - 2)}$

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

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

6) $y = 1 + \dfrac{1}{x} + \dfrac{1}{x^2} + \dfrac{1}{x^3}$

7) $y = \dfrac{(x^2 - 3x + 1)^5}{(x+1)^3 \cdot (x+2)^2}$

8) $x^2 y^2 = x^2 + y^2$

9) $\dfrac{1}{y} + \dfrac{1}{x} = 1$

10) $x^2 + y^2 = 2xy$

11) $(x+y)^3 + (x-y)^3 = x^4 + y^4$

12) $x^{\frac{2}{3}} + y^{\frac{2}{3}} = 1$

B: Find $\dfrac{dy}{dt}$ for each of the following:

1) $y = x^2$, $X = 2t + 1$

2) $y = 5 - \dfrac{x}{3}$, $X = t^2$

3) $y + 4x^2 = 1$, $X + \dfrac{5}{4}t = 1$

4) $y = \sqrt{x+2}$; $X = \dfrac{2}{t}$

5) $y = \dfrac{x^2}{x^2+1}$; $X = \sqrt{2t+1}$

6) $y = x^2 + 2X - 7$; $X = 2t + 1$

7) $y = x^{2/3}$, $X = t^2 + 1$

8) $y = x^2 + \dfrac{1}{x}$; $X = 2S^2 + S - 1$, $S = 3t^2$

C: Find $\dfrac{dy}{dx}$ for each of the following:—

1) $y = t^2 + t + 1$; $X = 2t + 3$

2) $y = \theta + \dfrac{1}{\theta}$; $X = \theta^2 - 2\theta + 5$

3) $y = \sqrt{t^2 + 12}$; $X = t^{-2}$

4) $X = \dfrac{t-1}{t+1}$, $y = \dfrac{t+1}{t-1}$

5) $X = t\sqrt{2t+5}$; $y = (4t)^{1/2}$

6) $X = \sqrt{2t^2 + 1}$; $y = (2t+1)^2$

7) $X = \dfrac{1}{t} + t^2$; $y = t^2 - t + 1$