

Thank

① Given $y = x^{\frac{7}{2}}$

we know that

$$\frac{d}{dx} x^n = n x^{n-1}$$

$$\therefore \frac{dy}{dx} = \frac{d}{dx} (x^{\frac{7}{2}})$$

Here $n = \frac{7}{2}$

$$= \frac{7}{2} (x)^{\frac{7}{2}-1} = \frac{7}{2} x^{\frac{5}{2}}$$

②

Given $a = x^{-3}$

we know that

$$\frac{d}{dx} x^n = n x^{n-1}$$

$$\therefore \frac{da}{dx} = \frac{d}{dx} (x^{-3})$$

Here $n = -3$

$$= (-3 x^{-3-1}) = -3x^{-4}$$

③

Given $a = t$

$$\therefore \frac{da}{dt} = \frac{dt}{dt} = 1$$

④

Given $y = x^5 + x^3$

$$\therefore \frac{dy}{dx} = \frac{d}{dx} [x^5 + x^3]$$

$$= \frac{d}{dx} x^5 + \frac{d}{dx} x^3$$

we know $\frac{d}{dx} x^n = n x^{n-1}$

$$\therefore \Rightarrow 5x^{5-1} + 3x^{3-1}$$

$$= 5x^4 + 3x^2$$

⑤ Given $P = 5t^4 + 6t^3 + 9t$

$$\therefore \frac{dP}{dt} = \frac{d}{dt} [5t^4 + 6t^3 + 9t]$$

$$= 5 \frac{d}{dt} t^4 + 6 \frac{d}{dt} t^3 + 9 \frac{d}{dt} t$$

$$\Rightarrow 5(4t^{4-1}) + 6(3t^{3-1}) + 9$$

$$= 20t^3 + 18t^2 + 9$$

$$[\because \frac{d}{dx} x^n = n x^{n-1}]$$

⑥ Given $s = t^2 + 5t + 3$.

$$\begin{aligned} \therefore \frac{ds}{dt} &= \frac{d}{dt} [t^2 + 5t + 3] \\ &= \frac{d}{dt} t^2 + 5 \frac{d}{dt} t + \frac{d}{dt} (3) \\ &= 2t^{2-1} + 5 + 0 \\ &= 2t + 5 \end{aligned}$$

$$\left[\frac{d}{dx} x^n = nx^{n-1}; \frac{d}{dx} (\text{const}) = 0 \right]$$

⑦ Given $A = 3t^2 + 7 \text{ cm}^2$

The rate of increase of area

$$\begin{aligned} \frac{dA}{dt} &= \frac{d}{dt} [3t^2 + 7] \\ &= 3 \frac{d}{dt} t^2 + \frac{d}{dt} (7) \\ &= 3 [2t^{2-1}] + 0 \\ &= 6t \quad \text{At } t=5 \\ \frac{dA}{dt} &= 6(5) = 30 \text{ cm}^2/\text{sec} \end{aligned}$$

⑧ From $\frac{d}{dx} x^n = nx^{n-1}$

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

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

(c) $\frac{d}{dy} y^{-5} = -5y^{-5-1} = -5y^{-6}$

(10) A: $\frac{d}{dt} t^5 = 5t^{5-1} = 5t^4$

(12) Given $y = \sqrt{x} = x^{\frac{1}{2}}$

$$\begin{aligned} \therefore \frac{dy}{dx} &= \frac{d}{dx} x^{\frac{1}{2}} = \frac{1}{2} x^{\frac{1}{2}-1} \\ &= \frac{1}{2} x^{-\frac{1}{2}} \\ &= \frac{1}{2} \frac{1}{x^{\frac{1}{2}}} = \frac{1}{2\sqrt{x}} \end{aligned}$$

From $\frac{d}{dx} x^n = nx^{n-1}$

(13) Given $a = t^{-\frac{3}{2}}$

$$\begin{aligned} \frac{da}{dt} &= \frac{d}{dt} (t^{-\frac{3}{2}}) = -\frac{3}{2} t^{-\frac{3}{2}-1} \\ &= -\frac{3}{2} t^{-\frac{5}{2}} \end{aligned}$$

At $t = 4 \text{ sec}$

$$\begin{aligned} \frac{da}{dt} &= -\frac{3}{2} [4]^{-\frac{5}{2}} \\ &= -\frac{3}{2} [2^2]^{-\frac{5}{2}} = -\frac{3}{2} 2^{-5} \\ &= -\frac{3}{2} \times \frac{1}{2^5} = -\frac{3}{64} \end{aligned}$$

(14)

Given $y = \sqrt{x}$; $a = t^{-\frac{3}{2}}$

$$\frac{dy}{dx} = \frac{1}{2\sqrt{x}} \quad ; \quad \frac{da}{dt} = -\frac{3}{2} \frac{1}{t^{\frac{5}{2}}}$$

$$\begin{aligned} \therefore \frac{dy}{dx} \times \frac{da}{dt} &= \frac{1}{2\sqrt{x}} \left[-\frac{3}{2} \right] \frac{1}{t^{\frac{5}{2}}} \\ &= \frac{-3}{4\sqrt{x} t^{\frac{5}{2}}} \end{aligned}$$

Task
SAGAN

(1)

$$y = x^{15}$$

$$\begin{aligned} \therefore \frac{dy}{dx} &= \frac{d}{dx} x^{15} \\ &= 15x^{15-1} \\ &= 15x^{14} \end{aligned}$$

(2)

$$a = t^{\frac{5}{2}}$$

we know $\frac{d}{dx} x^n = nx^{n-1}$

$\therefore \frac{da}{dt}$, Differentiation
w.r.t x is not possible
because a is a function of t

(3)

Given $y = 5t^2 + 3t$

$$\frac{dy}{dt} = \frac{d}{dt} (5t^2 + 3t)$$

$$= 5 \frac{d}{dt} t^2 + 3 \frac{d}{dt} t$$

$$= 5(2t^{2-1}) + 3$$

$$= 10t + 3$$

(4)

Given $y = -3t^{-3}$

$$\therefore \frac{dy}{dt} = \frac{d}{dt} (-3t^{-3})$$

$$= -3 \left(\frac{d}{dt} t^{-3} \right) \left[\because \frac{d}{dx} x^n = nx^{n-1} \right]$$

$$= -3(-3t^{-3-1})$$

$$= 9t^{-4}$$



5)

Given $a = bx^3 + cx^4$

$$\therefore \frac{da}{dx} = \frac{d}{dx} [bx^3 + cx^4]$$

We know $\frac{d}{dx} x^n = nx^{n-1}$

$$\begin{aligned} \Rightarrow \frac{da}{dx} &= b \frac{d}{dx} x^3 + c \frac{d}{dx} x^4 \\ &= b[3x^{3-1}] + c[4x^{4-1}] \\ &= 3bx^2 + 4cx^3 \end{aligned}$$

7)

Given $s = 4t^2 + 2t$

Rate of increase in displacement

$$\frac{ds}{dt} = \frac{d}{dt} [4t^2 + 2t]$$

$$= 4 \frac{d}{dt} t^2 + 2 \frac{d}{dt} t$$

$$= 4[2t^{2-1}] + 2$$

$$= 8t + 2$$

At $t = 2 \text{ sec}$

$$\frac{ds}{dt} = 8(2) + 2$$

$$= 16 + 2$$

$$= 18$$

12)

Given $y = 4x^3 + 2x^2$

$$\therefore \frac{dy}{dx} = 12x^2 + 4x \frac{d}{dx} (4x^3 + 2x^2)$$

$$= 4 \frac{d}{dx} x^3 + 2 \frac{d}{dx} x^2$$

$$= 12x^2 + 4x$$

At $x = \frac{1}{2}$ $\therefore \frac{dy}{dx} = 12\left(\frac{1}{2}\right)^2 + 4\left(\frac{1}{2}\right)$
 $= 3 + 2 = 5$

6)

Given $v = 9t^2 + 3$

$$\text{Then } \frac{dv}{dt} = \frac{d}{dt} [9t^2 + 3]$$

$$= 9 \frac{d}{dt} t^2 + \frac{d}{dt} (3)$$

$$= 9[2t^{2-1}] + 0$$

$$= 18t$$

10) Given $y = 4x^3 + 2x^2$

$$\therefore \frac{dy}{dx} = \frac{d}{dx} [4x^3 + 2x^2]$$

$$= 4 \frac{d}{dx} x^3 + 2 \frac{d}{dx} x^2$$

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

$$= 12x^2 + 4x$$

at $x = 1$

$$\frac{dy}{dx} = 12(1)^2 + 4(1)$$

$$= 12 + 4$$

$$= 16$$

11)

Given

Given $y = 4x^3 + 2x^2$

$$\frac{dy}{dx} = \frac{d}{dx} [4x^3 + 2x^2]$$

$$= 4 \frac{d}{dx} x^3 + 2 \frac{d}{dx} x^2$$

$$= 12x^2 + 4x$$

At $x = 3 \Rightarrow \frac{dy}{dx} = 12(3)^2 + 4(3)$

$$= 108 + 12 = 120$$

