DSSSB TGT PART(A+B)

MATHS

CALCULUS

(LIMITS & CONTINUITY)

Part -5

LIVE STREAMING

05/06/2024 04:30PM

Chain Rule →

$$y = f(g(x))$$

$$\boxed{\frac{dy}{dx} = f'(g(x)) \cdot g'(x)}$$

$y = \sin(x^3)$

$\frac{dy}{dx} = \cos x^3 \cdot 3x^2$

$\Rightarrow 3x^2 \cdot \cos x^3$

$y = (\sin 4x)$

$\frac{dy}{dx} = \cos 4x \cdot 4$

$\Rightarrow 4\cos 4x$

$$y = \sin(x^2)$$

$$\frac{dy}{dx} = \cos x^2 \cdot 2x$$

$$= 2x \cdot \cos x^2$$

$$x^n \, dx = \boxed{n(x)^{n-1}}$$

$4x^2$

$y = x^3$

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

① $y = (2x+1)^3$

$y = 8x^3 + 1 + 12x^2 + 6x$

$\frac{dy}{dx} = 24x^2 + 0 + 24x + 6$

$\Rightarrow 24x^2 + 24x + 6$

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

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

$\Rightarrow 6(2x+1)^2$

$= 6(4x^2 + 1 + 4x)$

$\Rightarrow 24x^2 + 24x + 6$

② $y = (x^3 + 2x^2 - 1)^{100}$

$\frac{dy}{dx} = 100(x^3 + 2x^2 - 1)^{99} \cdot (3x^2 + 4x)$

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

$$\Rightarrow x^2 + 4 + 4x$$

$$\frac{dy}{dx} = 2x + 0 + 2$$

$$\Rightarrow 2(x+1)$$

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

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

$$2(x+1)$$

1. Find the derivative of the following:

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(i) $2x - \frac{3}{4}$

(ii) $(5x^3 + 3x - 1)(x - 1)$

(ii) $x^{-3}(5 + 3x)$

(iv) $x^5(3 - 6x^{-9})$

(v) $x^{-4}(3 - 4x^{-5})$

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

(i) $\frac{dy}{dx} = 2$

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

$\frac{dy}{dx} = (15x^2+3)(x-1) + (5x^3+3x-1)(1)$

$15x^3 - 15x^2 + 3x - 3$

$+ 5x^3 + 3x - 1$

$20x^3 - 15x^2 + 6x - 4$

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

$\Rightarrow 5x^{-3} + 3x^{-2}$

$\frac{dy}{dx} = -15x^{-4} - 6x^{-3}$

$\Rightarrow -3\left[\frac{5}{x^4} + \frac{2}{x^3}\right]$

$y \rightarrow \frac{u}{v} =$

$y' = \frac{u'v - uv'}{v^2}$

$-4-5$

(v) $y = x^{-4}(3-4x^{-5})$

$\Rightarrow 3x^{-4} - 4x^{-9}$

$\frac{dy}{dx} = -12x^{-5} + 36x^{-10}$

$\Rightarrow 12\left(\frac{3}{x^{10}} - \frac{1}{x^5}\right)$

$-9+5$

(iv) $y = x^5(3-6x^{-9})$

$y = 3x^5 - 6x^{-4}$

$\frac{dy}{dx} = 15x^4 + 24x^{-5}$

$\Rightarrow 15x^4 + \frac{24}{x^5}$

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

$\frac{dy}{dx} = \frac{0(\ ) - 2(1)}{(x+1)^2} - \frac{3x(3x-1) - x^2(3)}{(3x-1)^2}$

$y = \frac{u}{v}$

$y' = \frac{u'v - uv'}{v^2}$

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

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

$y = \frac{u}{v}$

$y' = \frac{u'v - uv'}{v^2}$

2nd

$y = \frac{u}{v}$

$\frac{dy}{dx} = \frac{\frac{du}{dx} \cdot v - u \cdot \frac{dv}{dx}}{v^2}$

(i) $f(x) = \frac{2x+3}{x-2}$

(ii) $f(x) = x + \frac{1}{x}$

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

$\Rightarrow \frac{2x - 4 - 2x - 3}{(x-2)^2}$

$\Rightarrow \frac{-7}{(x-2)^2}$

$f'(x) = 1 - \frac{1}{x^2} \Rightarrow \frac{x^2 - 1}{x^2}$

3. ***Find the derivative of*** $f(x) = \frac{x+1}{x}$.

$f(x) = \frac{x+1}{x}$ का अवकलज ज्ञात कीजिए।

$$f(x) = \frac{x}{x} + \frac{1}{x}$$

$$f(x) = 1 + \frac{1}{x}$$

$$f'(x) = 0 - \frac{1}{x^2} \Rightarrow -\frac{1}{x^2}$$

Integration (समाकलन) →

- InDefinite Int.
- Definite Int.

Basic formulae →

1. $\int \cos x \, dx = \sin x + C$
2. $\int \sin x \, dx = -\cos x + C$
3. $\int \sec^2 x \, dx = \tan x + C$
4. $\int \sec x \cdot \tan x \, dx = \sec x + C$
5. $\int \operatorname{cosec}^2 x \, dx = -\cot x + C$
6. $\int \operatorname{cosec} x \cdot \cot x \, dx = -\operatorname{cosec} x + C$
7. $\int e^x \, dx = e^x + C$
8. $\int a^x \, dx = \frac{a^x}{\log a} + C$
9. $\int dx = x + C$

10. $\int 0 \cdot dx = C$

Imp 11. $\int x^n dx = \frac{x^{n+1}}{n+1} + C$

Q. $\int 7x^7 dx = ?$

12. $\int \frac{1}{x} dx = \log x + C$

$$\int 7 \cdot x^7 \cdot dx = ?$$

$$\Rightarrow 7 \cdot \frac{x^{7+1}}{7+1} + C$$

$$7 \frac{x^8}{8} + C$$ Ans

SOME PROPERTIES →

① $$\int a x^n dx \Rightarrow a \int x^n dx$$

② $$\int (g(x) + h(x))\, dx = \int g(x) dx + \int h(x) dx$$

③ $$\int [g(x) - h(x)]\, dx = \int g(x) dx - \int h(x) dx$$

Definite Integration →

Upper Limit $x = 2$

Lower Limit $x = 1$

$$\int_1^2 x^3\,dx \Rightarrow \left(\frac{x^4}{4}\right)_1^2 \Rightarrow \left[\frac{2^4}{4} - \frac{1^4}{4}\right]$$

$$\Rightarrow \frac{16}{4} - \frac{2}{4}$$

$$\Rightarrow \frac{14}{4} \Rightarrow \frac{7}{2}$$

$$\int_1^2 3x^4\,dx \Rightarrow \frac{3x^5}{5}\Big|_1^2 \Rightarrow \left[\frac{3\times 2^5}{5} - \frac{3\times 1^5}{5}\right]$$

$$\rightarrow \frac{96}{5} - \frac{3}{5}$$

$$\rightarrow \frac{93}{5}$$

$$\frac{726}{5}$$

$$\int_0^{\pi/2} \cos x \cdot dx \Rightarrow \left(\sin x \right)_0^{\pi/2} \Rightarrow \left(\sin\frac{\pi}{2} - \sin 0 \right)$$

$$\Rightarrow 1 - 0 = 1$$