مراجعة على قوانين التفاضل

1. $\frac{d}{dx} f(x) \pm g(x) = f'(x) \pm g'(x)$

2. $\frac{d}{dx} (f(x) \cdot g(x)) = f(x) \cdot g'(x) + f'(x) \cdot g(x)$

3. $\frac{d}{dx} \left(\frac{f(x)}{g(x)} \right) = \frac{g(x) \cdot f'(x) - f(x) \cdot g'(x)}{(g(x))^2}$

4. $\frac{d}{dx} (f(x))^n = n(f(x))^{n-1} \cdot f'(x)$

5. $\frac{d}{dx} \ln x = 1/x$

6. $\frac{d}{dx} \ln f(x) = \frac{f'(x)}{f(x)}$

7. $\frac{d}{dx} e^x = e^x$

8. $\frac{d}{dx} e^{f(x)} = e^{f(x)} \cdot f'(x)$

9. $\frac{d}{dx} (a)^{f(x)} = a^{f(x)} \cdot f'(x) \cdot \ln a$

Note

10. $\ln e^x = x$

11. $\ln a + \ln b = \ln(a \cdot b)$ ⇨ ((جمع))

12. $\ln a - \ln b = \ln\left(\frac{\ln a}{\ln b}\right)$ ⇨ ((طرح))

13. $a^{x+y} = a^x \cdot a^y$

تفاضل الدوال المثلثية

السالبه

$\ominus \sin \qquad -\operatorname{cosec}$

$\frac{d}{dx} \sin x = \cos x$

$\frac{d}{dx} \cos x = \ominus \sin x$

$\frac{d}{dx} \tan x = \sec^2 x$

$\frac{d}{dx} \operatorname{cosec} x = \ominus \operatorname{cosec} x \cdot \cot x$

$\frac{d}{dx} \sec x = \sec x \cdot \tan x$

$\frac{d}{dx} \cot x = \ominus \operatorname{cosec}^2 x$

Note

$$\boxed{\frac{d}{dx} \sin f(x) = \cos f(x) \cdot f'(x)}$$

تفاضل الدوال المثلثية العكسية

$\frac{d}{dx} \sin^{-1} x = \frac{+1}{\sqrt{1-x^2}}$

$\frac{d}{dx} \cos^{-1} x = \frac{-1}{\sqrt{1-x^2}}$

$\frac{d}{dx} \operatorname{cosec}^{-1} x = \frac{-1}{x\sqrt{x^2-1}}$

$\frac{d}{dx} \sec^{-1} x = \frac{+1}{x\sqrt{x^2-1}}$

$\frac{d}{dx} \tan^{-1} x = \frac{+1}{1+x^2}$

$\frac{d}{dx} \cot^{-1} x = \frac{-1}{1+x^2}$

Note

$$\frac{d}{dx} \sin^{-1} f(x) = \frac{f'(x)}{\sqrt{1-f(x)^2}}$$

تفاضل الدوال الزائدية

Note

في الدوال الزائدية المقلوبات سوالبات

$\frac{d}{dx} \sinh x = \cosh x$

$\frac{d}{dx} \cosh x = \sinh x$

$\frac{d}{dx} \tanh x = \operatorname{sech}^2 x$

$\frac{d}{dx} \operatorname{cosech} x = - \operatorname{cosech} x \cdot \coth x$

$\frac{d}{dx} \operatorname{sech} x = - \operatorname{sech} x \cdot \tanh x$

$\frac{d}{dx} \coth x = - \operatorname{cosech}^2 x$

Note

$\frac{d}{dx} \sinh f(x) = \cosh f(x) \cdot f'(x)$

تفاضل الدوال الزائدية العكسية

$\frac{d}{dx} \sinh^{-1} x = \frac{1}{\sqrt{x^2+1}}$

$\frac{d}{dx} \cosh^{-1} x = \frac{1}{\sqrt{x^2-1}}$

$\frac{d}{dx} \tanh^{-1} x = \frac{1}{1-x^2}$

Note

$\frac{d}{dx} \tan^{-1} f(x) = \frac{f'(x)}{1-f(x)^2}$

مراجعة في أهم قوانين التكامل

$$\int [f(x) \pm g(x)]\,dx = \int f(x)\,dx \pm \int g(x)\,dx$$

$$\int (f(x))^n f'(x)\,dx = \frac{(f(x))^{n+1}}{n+1} + c$$

$$\int \frac{f'(x)}{f(x)}\,dx = \ln f(x) + c$$

$$\int \frac{f'(x)}{\sqrt{f(x)}} = 2\sqrt{f(x)} + c$$

$$\int x^n\,dx = \frac{x^{n+1}}{n+1} + c$$

$$\int e^{f(x)} = \frac{e^{f(x)}}{f'(x)} \Rightarrow \frac{d}{dx} e^{f(x)} = e^{f(x)} \cdot f'(x)$$

الدوال المثلثية

$$\int \cot x\,dx = \ln \sin x + c$$

$$\int \tan x\,dx = -\ln \cos x + c$$

$$\int \sec x\,dx = \ln(\sec x + \tan x) + c$$

$$\int \csc x\,dx = \ln[\cot x - \csc x] + c$$

Note

- ★ $\sin^2 x + \cos^2 x = 1$
- ★ $\sin 2x = 2\sin x \cdot \cos x$
- ★ $\cos^2(x) = \frac{1}{2}[1 + \cos 2x]$
- ★ $\sin^2(x) = \frac{1}{2}[1 - \cos 2x]$

$\star \tan^2 x + 1 = \sec^2 x$

$\star \cot^2 x + 1 = \operatorname{cosec}^2 x$

$\Rightarrow \boxed{\tan x = \dfrac{\sin x}{\cos x}} \Rightarrow \boxed{\cot x = \dfrac{\cos x}{\sin x}}$

تكاملات هاااامة جداً

$$\int \cos 2x \, dx = \frac{\sin 2x}{2} + c$$

$$\int \sin 2x \, dx = -\frac{\cos 2x}{2} + c$$

$$\int \sec^2 2x \, dx = \frac{\tan 2x}{2} + c$$

تكامل بالتجزئ

$$\boxed{\int u \, dv = uv - \int v \, du}$$

تكامل بإزالة الجذور

$$\int \frac{\pm\, dx}{\sqrt{a^2 - x^2}} = \begin{cases} \oplus \ \sin^{-1} x/a + c \\ \ominus \ \cos^{-1} x/a + c \end{cases}$$

$\sqrt{a^2 - x^2} \Rightarrow x = a \sin\theta$

Note: $1 - \sin^2\theta = \cos^2\theta$

$$\int \frac{\pm\, dx}{a^2 + x^2} = \begin{cases} \oplus \ 1/a \tan^{-1} x/a + c \\ \ominus \ 1/a \cot^{-1} x/a + c \end{cases}$$

$\sqrt{a^2 + x^2} \Rightarrow x = a \tan\theta$

Note: $1 + \tan^2\theta = \sec^2\theta$

$$\int \frac{dx}{x\sqrt{x^2 - a^2}} = 1/a \sec^{-1} x/a + c$$

$\sqrt{x^2 - a^2} \Rightarrow x = a \sec\theta$

Note: $\sec^2\theta - 1 = \tan^2\theta$

استعن بالله ولا تعجز