BẢNG CÔNG THỨC ĐẠO HÀM - NGUYÊN HÀM

I. Các công thức tính đạo hàm.

1. $(u \pm v)' = u' \pm v'$ **2.** $(u.v)' = u'.v + u.v'$ **3.** $\left(\dfrac{u}{v}\right)' = \dfrac{u'.v - u.v'}{v^2}$

Hệ Quả: **1.** $ku\ ' = k.u'$ **2.** $\left(\dfrac{1}{v}\right)' = \dfrac{-v'}{v^2}$

II. Đạo hàm và nguyên hàm các hàm số sơ cấp.

Bảng đạo hàm		**Bảng nguyên hàm**	
$x^{\alpha}\ ' = \alpha x^{\alpha-1}$	$\left(u^{\alpha}\right)' = \alpha.u'.u^{\alpha-1}$	$\int x^{\alpha}dx = \dfrac{x^{\alpha+1}}{\alpha+1} + c,\ (\alpha \neq -1)$	$\int (ax+b)^{\alpha}dx = \dfrac{1}{a}.\dfrac{(ax+b)^{\alpha+1}}{\alpha+1} + c$
$(\sin x)' = \cos x$	$(\sin u)' = u'.\cos u$	$\int \sin x dx = -\cos x + c$	$\int \sin(ax+b)dx = -\dfrac{1}{a}\cos(ax+b) + c$
$(\cos x)' = -\sin x$	$(\cos u)' = -u'.\sin u$	$\int \cos x dx = \sin x + c$	$\int \cos(ax+b)dx = \dfrac{1}{a}\sin(ax+b) + c$
$(\tan x)' = \dfrac{1}{\cos^2 x} = 1 + \tan^2 x$	$(\tan u)' = \dfrac{u'}{\cos^2 u} = u'.\left(1 + \tan^2 u\right)$	$\int \dfrac{1}{\cos^2 x}dx = \tan x + c$	$\int \dfrac{1}{\cos^2(ax+b)}dx = \dfrac{1}{a}\tan(ax+b) + c$
$(\cot x)' = \dfrac{-1}{\sin^2 x} = -\left(1 + \cot^2 x\right)$	$(\cot u)' = \dfrac{-u'}{\sin^2 u} = -u'.\left(1 + \cot^2 u\right)$	$\int \dfrac{1}{\sin^2 x}dx = -\cot x + c$	$\int \dfrac{1}{\sin^2(ax+b)}dx = -\dfrac{1}{a}\cot(ax+b) + c$
$\log_a x\ ' = \dfrac{1}{x\ln a}$	$\log_a u\ ' = \dfrac{u'}{u.\ln a}$	$\int \dfrac{1}{x}dx = \ln\lvert x\rvert + c$	$\int \dfrac{1}{ax+b}dx = \dfrac{1}{a}\ln\lvert ax+b\rvert + c$
$\ln x\ ' = \dfrac{1}{x}$	$\ln u\ ' = \dfrac{u'}{u}$		
$a^x\ ' = a^x.\ln a$	$a^u\ ' = a^u.u'.\ln a$	$\int a^x dx = \dfrac{a^x}{\ln a} + c$	$\int a^{\alpha x+\beta}dx = \dfrac{a^{\alpha x+\beta}}{\alpha.\ln a} + c$
$e^x\ ' = e^x$	$\left(e^u\right)' = u'.e^u$	$\int e^x dx = e^x + c$	$\int e^{ax+b}dx = \dfrac{1}{a}e^{ax+b} + c$

Bổ sung:

$\int \dfrac{dx}{x^2+a^2} = \dfrac{1}{a}\arctan\dfrac{x}{a} + C$ | $\int \dfrac{dx}{x^2-a^2} = \dfrac{1}{2a}\ln\left|\dfrac{x-a}{x+a}\right| + C$ | $\int \dfrac{dx}{\sqrt{a^2-x^2}} = \arcsin\dfrac{x}{a} + C$ | $\int \dfrac{dx}{\sqrt{x^2 \pm a^2}} = \ln\left|x + \sqrt{x^2 \pm a^2}\right| + C$

III. Vi phân: $\boxed{dy = y'.dx}$

VD: $d(ax+b) = adx \Rightarrow dx = \dfrac{1}{a}d(ax+b)$, $d(\sin x) = \cos x dx$, $d(\cos x) = -\sin x dx$,

$d(\ln x) = \dfrac{dx}{x}$, $d(\tan x) = \dfrac{dx}{\cos^2 x}$, $d(\cot x) = -\dfrac{dx}{\sin^2 x}$ ...

I. Công thức hàm số Mũ và Logarit.

Hám số mũ	Hàm số Logarit
$a^{-\alpha} = \dfrac{1}{a^{\alpha}}; a^{\frac{\alpha}{\beta}} = \sqrt[\beta]{a^{\alpha}}$ $a^{\alpha}.a^{\beta} = a^{\alpha+\beta}$; $\dfrac{a^{\alpha}}{a^{\beta}} = a^{\alpha-\beta}$ $a^{\alpha.\beta} = a^{\alpha}{}^{\beta} = a^{\beta}{}^{\alpha}$ $a.b{}^{\alpha} = a^{\alpha}.b^{\alpha}$; $\left(\dfrac{a}{b}\right)^{\alpha} = \dfrac{a^{\alpha}}{b^{\alpha}}$	$\log_a x = M \Leftrightarrow x = a^M \quad 0 < x, 0 < a \neq 1$ $\log_a 1 = 0$; $\log_a a = 1$; $\log_a b^{\alpha} = \alpha \log_a b$ $\log_{a^{\alpha}} b = \dfrac{1}{\alpha}\log_a b$; $\log_a a^{\alpha} = \alpha$ $\log_a b.c = \log_a b + \log_a c$ $\log_a \dfrac{b}{c} = \log_a b - \log_a c$ $a^{\log_b c} = c^{\log_b a}$; $a^{\log_a \alpha} = \alpha$ $\log_a b = \log_a c.\log_c b = \dfrac{\log_c b}{\log_c a}$ $\log_a b = \dfrac{1}{\log_b a}$
$a^{\alpha} = a^{\beta} \Leftrightarrow \alpha = \beta \quad 0 < a \neq 1$	$\log_a \alpha = \log_a \beta \Leftrightarrow \alpha = \beta$
$a > 1 : a^{\alpha} > a^{\beta} \Leftrightarrow \alpha > \beta$ $0 < a \neq 1 : a^{\alpha} > a^{\beta} \Leftrightarrow \alpha < \beta$	$a > 1 : \log_a \alpha > \log_a \beta \Leftrightarrow \alpha > \beta$ $0 < a \neq 1 : \log_a \alpha > \log_a \beta \Leftrightarrow \alpha < \beta$

II.Một số giới hạn thường gặp.

1. $\lim\limits_{x\to\infty}\left(1+\dfrac{1}{x}\right)^{x} = e$

2. $\lim\limits_{x\to\infty}(1+x)^{\frac{1}{x}} = e$

3. $\lim\limits_{x\to 0}\dfrac{a^{x}-1}{x} = \ln a$

4. $\lim\limits_{x\to 0}\dfrac{(1+x)^{a}}{x} = a$

5. $\lim\limits_{x\to 0}\dfrac{\log_a(1+x)}{x} = \log_a e$