

# فرمول های مشتق گیری

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در تمام فرمول های زیر  $w, r$  و  $u$  بر حسب  $x$  فرض شده اند.

تابع	مشتق	مثال
$y = a$	$y' = 0$	$y = 3 \Rightarrow y' = 0$
$y = ax$	$y' = a$	$y = 7x \Rightarrow y' = 7$
$y = ax^n$	$y' = a.nx^{n-1}$	$y = 2x^3 \Rightarrow y' = 2 \times 3 \times x^2$
$y = u \pm v \pm \dots$	$y' = u' \pm v' \pm \dots$	$y = 3x^2 - 5x + 7 \Rightarrow y' = 6x - 5$
$y = u.v$	$y' = u'.v + v'.u$	$y = (3x^4)(\sin x) \Rightarrow y' = (12x^3)\sin x + (\cos x).3x^4$
$y = au$	$y' = au'$	$y = 5\cos \Rightarrow y' = -5\sin x$
$y = \frac{u}{v}$	$y' = \frac{u'.v - v'.u}{v^2}$	$y = \frac{3x^2}{\tan x} \Rightarrow y' = \frac{6x(\tan x) - (1 + \tan^2 x)3x^2}{\tan^2 x}$
$y = \frac{u}{a}$	$y' = \frac{u'}{a}$	$y = \frac{\cot x}{5} \Rightarrow y' = \frac{-(1 + \cot^2 x)}{5}$
$y = \frac{a}{u}$	$y' = \frac{-au'}{u^2}$	$y = \frac{3}{x^5} \Rightarrow y' = \frac{-3(5x^4)}{x^{10}} = \frac{-15}{x^6}$
$y = \frac{au+b}{cu+d}$	$y' = \frac{ad-bc}{(cu+d)^2} u'$	$y = \frac{3x+5}{2x-7} \Rightarrow y' = \frac{21-10}{(2x-7)^2} = \frac{-31}{(2x-7)^2}$
$y = au^m$	$y' = m.a.u' . u^{m-1}$	$y = 5(\sin^2 x) \Rightarrow y' = 4 \times 5 \times \cos x \times \sin^3 x$
$y = \sqrt{u}$	$y' = \frac{u'}{2\sqrt{u}}$	$y = \sqrt{x} \Rightarrow y' = \frac{1}{2\sqrt{x}}$
$y = \sqrt[m]{n^n}$	$y' = \frac{nu'}{m\sqrt[m]{u^{m-n}}}$	$y = \sqrt[5]{x^3} \Rightarrow y' = \frac{3}{5\sqrt[5]{x^2}}$
$y =  u $	$y' = \frac{u'.u}{ u }$	$y =  x^2 + x  \Rightarrow y' = \frac{(2x+1)(x^2+x)}{ x^2+x }$
$y = a \sin u$	$y' = au' \cos u$	$y = -3\sin(2x^3+5) \Rightarrow y' = (-3)(6x^2)\cos(2y^3+5) = -18x^2 \cos(2x^3+5)$
$y = a \cos u$	$y' = -au' \sin u$	$y = 3\cos(\sqrt{x}) \Rightarrow y' = -(3)(\frac{1}{2\sqrt{x}}).\sin \sqrt{x}$
$y = a \tan u$	$y' = au'(1 + \tan^2 u)$	$y = 3 \tan(\cos) \Rightarrow y' = 3(-\sin x)(1 + \tan^2(\cos x))$
$y = a \cot u$	$y' = -au'(1 + \cot^2 u)$	$y = 5 \cot x \Rightarrow y' = -5(1 + \cot^2 x)$
$y = a \sin^m u$	$y' = mau' \cos u \sin^{m-1} u$	$y = 2 \sin^3(x^5) \Rightarrow y' = (2 \times 3)(5x^4)(\cos(x^5)) \sin^2(x^5)$
$y = a \cos^m u$	$y' = -mau' \sin u \cos^{m-1} u$	$y = 5 \cos^4(\sqrt{x}) \Rightarrow y' = -(4)(5)(\frac{1}{2\sqrt{x}})(\sin \sqrt{x})(\cos^3 \sqrt{x})$

$y = a \tan^m u$	$y' = mau'(1 + \tan^2 u) \tan^{m-1} u$	$y = 7 \tan^5 x \Rightarrow y' = 7 \times 5(1 + \tan^2 x) \tan^4 x$
$y = a \cot^m u$	$y' = -mau'(1 + \cot^2 u) \cot^{m-1} u$	$y = 2 \cot^3 x \Rightarrow y' = -(3)(2)(1 + \cot^2 x) \cot^2 u$
$y = a \sec u$	$y' = au' \cdot \sin u \cdot \sec^2 u$	$y = \sec x \Rightarrow y' = \sin \cdot \sec^2 u$
$y = a \csc u$	$y' = -au' \cos u \csc^2 u$	$y = \csc(5x) \Rightarrow y' = -5 \cos(5x) \csc^2(5x)$
$y = \text{Arcsin}$	$y' = \frac{u'}{\sqrt{1-u^2}}$	$y = \text{Arcsin}(3x) \Rightarrow y' = \frac{3}{\sqrt{1-9x^2}}$
$y = \text{Arc cos } u$	$y' = \frac{-u'}{\sqrt{1-u^2}}$	$y = \text{Arc cos}(3x^2 - 5x) \Rightarrow y' = \frac{-(6x-5)}{\sqrt{1-(3x^2-5x)^2}}$
$y = \text{Arc tan } u$	$y' = \frac{u'}{1+u^2}$	$y = \text{Arc tan } x \Rightarrow y' = \frac{1}{1+x^2}$
$y = \text{Arc cot } u$	$y' = \frac{-u'}{1+u^2}$	$y = \text{Arc cot}(\sin x) \Rightarrow y' = \frac{-\cos x}{1+\sin^2 x}$
$y = a^u$	$y' = u'a^u \text{ Lna}$	
$y = \sqrt{x}$	$y' = \frac{1}{2\sqrt{x}}$	$y = \sqrt{2} \Rightarrow y' = \frac{1}{2\sqrt{2}}$
$y = \text{Lnu}$	$y' = \frac{u'}{u}$	$\text{Lne} = 1 \checkmark$
$y = \sin x$	$y' = \cos x$	
$y = \cos x$	$y' = -\sin x$	
$y = \tan x$	$y' = 1 + \tan^2 x$	
$y = \cot x$	$y' = -(1 + \cot^2 x)$	
$y = [u]$	$y' = \begin{cases} 0 & u \notin \mathbb{Z} \\ \phi & u \in \mathbb{Z} \end{cases}$	

$$y = [u] \Rightarrow y' = 0$$

تذکر: در نقطه ای که  $u \in \mathbb{Z}$  و تابع  $u$  در آن نقطه مینیمم نسبی داشته باشد آنگاه :

$$y = \left[ \sin \frac{3\pi}{2} \right] \frac{\sin \frac{3\pi}{2} = -1 \in \mathbb{Z}}{\quad} \rightarrow y' = 0$$

$$y = \left[ \sin \frac{\pi}{3} \right] \frac{\sin \frac{\pi}{3} = \frac{\sqrt{3}}{2} \notin \mathbb{Z}}{\quad} \rightarrow y' = 0$$

$$y = [\sin \pi] \frac{\sin \pi = 0 \in \mathbb{Z}}{\quad} \rightarrow y' = \phi$$