Math 202

Differentiation Rules

Function	Differentiation	Function	Differentiation
$\frac{d}{dx}(x^n),\ n \neq -1$	nx^{n-1}	$\frac{d}{dx}(e^u),\quad u = u(x)$	$e^u . u'$
$\frac{d}{dx}(f . g)$	$f' . g + f . g'$	$\frac{d}{dx}(a^u)$	$a^u . u' . \ln a$
$\frac{d}{dx}\left(\frac{f}{g}\right)$	$\frac{f' . g - f . g'}{g^2}$	$\frac{d}{dx}(\log_a u)$	$\frac{u'}{u . \ln a}$
$\frac{d}{dx}[f(x)]^n,\ n \neq -1$	$n[f(x)]^{n-1} . f'(x)$	$\frac{d}{dx}(\ln u)$	$\frac{u'}{u}$
$\frac{d}{dx}\left(\sqrt{f(x)}\right)$	$\frac{f'(x)}{2\sqrt{f(x)}}$		
$\frac{d}{dx}(\sin u)$	$\cos u . u'$	$\frac{d}{dx}(\sin^{-1} u)$	$\frac{u'}{\sqrt{1-u^2}}$
$\frac{d}{dx}(\cos u)$	$-\sin u . u'$	$\frac{d}{dx}(\cos^{-1} u)$	$-\frac{u'}{\sqrt{1-u^2}}$
$\frac{d}{dx}(\tan u)$	$\sec^2 u . u'$	$\frac{d}{dx}(\tan^{-1} u)$	$\frac{u'}{1+u^2}$
$\frac{d}{dx}(\cot u)$	$-\csc^2 u . u'$	$\frac{d}{dx}(\cot^{-1} u)$	$-\frac{u'}{1+u^2}$
$\frac{d}{dx}(\sec u)$	$\sec u . \tan u . u'$	$\frac{d}{dx}(\sec^{-1} u)$	$\frac{u'}{u\sqrt{u^2-1}}$
$\frac{d}{dx}(\csc u)$	$-\csc u . \cot u . u'$	$\frac{d}{dx}(\csc^{-1} u)$	$-\frac{u'}{u\sqrt{u^2-1}}$
$\frac{d}{dx}(\sinh u)$	$\cosh u . u'$	$\frac{d}{dx}(\sinh^{-1} u)$	$\frac{u'}{\sqrt{u^2+1}}$
$\frac{d}{dx}(\cosh u)$	$\sinh u . u'$	$\frac{d}{dx}(\cosh^{-1} u)$	$\frac{u'}{\sqrt{u^2-1}}$
$\frac{d}{dx}(\tanh u)$	$\operatorname{sech}^2 u . u'$	$\frac{d}{dx}(\tanh^{-1} u)$	$\frac{u'}{1-u^2}$
$\frac{d}{dx}(\coth u)$	$-\operatorname{csch}^2 u . u'$	$\frac{d}{dx}(\coth^{-1} u)$	$\frac{u'}{1-u^2}$
$\frac{d}{dx}(\operatorname{sech} u)$	$-\operatorname{sech} u . \tanh u . u'$	$\frac{d}{dx}(\operatorname{sech}^{-1} u)$	$-\frac{u'}{u\sqrt{1-u^2}}$
$\frac{d}{dx}(\operatorname{csch} u)$	$-\operatorname{csch} u . \coth u . u'$	$\frac{d}{dx}(\operatorname{csch}^{-1} u)$	$-\frac{u'}{\lvert u\rvert\sqrt{1+u^2}}$