‘Box Method’ for Derivatives

The following indicates the derivative of various common functions by filling in a box—ignoring the chain rule. For example, to find $\frac{d}{dx}\tan(x^3)$, we fill in the box for $\frac{d}{dx}\tan(\square) = \sec^2(\square)$ with x^3 and remember to apply the chain rule—which says to multiply by the derivative the contents of $\square$. Therefore, $\frac{d}{dx}\tan\left(\boxed{x^3}\right) = \sec^2\left(\boxed{x^3}\right)\cdot\frac{d}{dx}x^3 = \sec^2\left(\boxed{x^3}\right)\cdot 3x^2 = 3x^2\sec^2(x^3)$.

- $\dfrac{d}{dx}(\text{constant}) = 0$
- $\dfrac{d}{dx}\square^n = n\,\square^{n-1}$
- $\dfrac{d}{dx}\#^{\square} = \#^{\square}\ln\#$
- $\dfrac{d}{dx}e^{\square} = e^{\square}$
- $\dfrac{d}{dx}\log_b(\square) = \dfrac{1}{(\square)\ln b}$
- $\dfrac{d}{dx}\ln(\square) = \dfrac{1}{\square}$
- $\dfrac{d}{dx}\sin(\square) = \cos(\square)$
- $\dfrac{d}{dx}\cos(\square) = -\sin(\square)$
- $\dfrac{d}{dx}\tan(\square) = \sec^2(\square)$
- $\dfrac{d}{dx}\csc(\square) = -\csc(\square)\cot(\square)$
- $\dfrac{d}{dx}\sec(\square) = \sec(\square)\tan(\square)$
- $\dfrac{d}{dx}\cot(\square) = -\csc(\square)\cot(\square)$
- $\dfrac{d}{dx}\arcsin(\square) = \dfrac{1}{\sqrt{1-(\square)^2}}$
- $\dfrac{d}{dx}\arccos(\square) = \dfrac{-1}{\sqrt{1-(\square)^2}}$
- $\dfrac{d}{dx}\arctan(\square) = \dfrac{1}{1+(\square)^2}$
- $\dfrac{d}{dx}\operatorname{arccsc}(\square) = \dfrac{-1}{|\square|\sqrt{(\square)^2-1}}$
- $\dfrac{d}{dx}\operatorname{arcsec}(\square) = \dfrac{1}{|\square|\sqrt{(\square)^2-1}}$
- $\dfrac{d}{dx}\operatorname{arccot}(\square) = \dfrac{-1}{1+(\square)^2}$

- $\dfrac{d}{dx}\sinh(\square) = \cosh(\square)$
- $\dfrac{d}{dx}\cosh(\square) = \sinh(\square)$
- $\dfrac{d}{dx}\tanh(\square) = \operatorname{sech}^2(\square)$
- $\dfrac{d}{dx}\operatorname{csch}(\square) = -\operatorname{csch}(\square)\coth(\square)$
- $\dfrac{d}{dx}\operatorname{sech}(\square) = -\operatorname{sech}(\square)\tanh(\square)$
- $\dfrac{d}{dx}\coth(\square) = -\operatorname{csch}^2(\square)$
- $\dfrac{d}{dx}\sinh^{-1}(\square) = \dfrac{1}{\sqrt{(\square)^2+1}}$
- $\dfrac{d}{dx}\cosh^{-1}(\square) = \dfrac{1}{\sqrt{(\square)^2-1}}$
- $\dfrac{d}{dx}\tanh^{-1}(\square) = \dfrac{1}{1-(\square)^2}$
- $\dfrac{d}{dx}\operatorname{csch}^{-1}(\square) = \dfrac{-1}{|\square|\sqrt{1+(\square)^2}}$
- $\dfrac{d}{dx}\operatorname{sech}^{-1}(\square) = \dfrac{-1}{(\square)\sqrt{1-(\square)^2}}$
- $\dfrac{d}{dx}\coth^{-1}(\square) = \dfrac{1}{1-(\square)^2}$