Standard Derivatives

The following derivatives can be quoted without proof unless a question specifically asks you to show details. These results can be combined with the standard rules of differentiation (not listed here) to differentiate more complicated functions. For example, $(d/dx)\sin(ax + b) = a\cos(ax + b)$. Natural domains common to both sides are assumed.

1. $\dfrac{d}{dx}\, x^k \;=\; kx^{k-1} \quad (k \in \mathbb{R})$

2. $\dfrac{d}{dx}\, e^x \;=\; e^x$

3. $\dfrac{d}{dx}\, \ln x \;=\; \dfrac{1}{x} \quad (x > 0)$

4. $\dfrac{d}{dx}\, \sin x \;=\; \cos x$

5. $\dfrac{d}{dx}\, \cos x \;=\; -\sin x$

6. $\dfrac{d}{dx}\, \tan x \;=\; \sec^2 x$

7. $\dfrac{d}{dx}\, \cot x \;=\; -\operatorname{cosec}^2 x$

8. $\dfrac{d}{dx}\, \sec x \;=\; \sec x \tan x$

9. $\dfrac{d}{dx}\, \operatorname{cosec} x \;=\; -\operatorname{cosec} x \cot x$

10. $\dfrac{d}{dx}\, \sinh x \;=\; \cosh x$

11. $\dfrac{d}{dx}\, \cosh x \;=\; \sinh x$

12. $\dfrac{d}{dx}\, \tanh x \;=\; \operatorname{sech}^2 x$

13. $\dfrac{d}{dx}\, \sin^{-1} x \;=\; \dfrac{1}{\sqrt{1 - x^2}} \quad (|x| < 1)$

14. $\dfrac{d}{dx}\, \cos^{-1} x \;=\; -\dfrac{1}{\sqrt{1 - x^2}} \quad (|x| < 1)$

15. $\dfrac{d}{dx}\, \tan^{-1} x \;=\; \dfrac{1}{1 + x^2}$

16. $\dfrac{d}{dx}\, \sinh^{-1} x \;=\; \dfrac{1}{\sqrt{1 + x^2}}$

17. $\dfrac{d}{dx}\, \cosh^{-1} x \;=\; \dfrac{1}{\sqrt{x^2 - 1}} \quad (x > 1)$

18. $\dfrac{d}{dx}\, \tanh^{-1} x \;=\; \dfrac{1}{1 - x^2} \quad (|x| < 1)$

End of Extended Answer Section

This is the last page of the question paper.