Derivatives and Integrals

Basic Differentiation Rules

1. $\dfrac{d}{dx}[cu] = cu'$

2. $\dfrac{d}{dx}[u \pm v] = u' \pm v'$

3. $\dfrac{d}{dx}[uv] = uv' + vu'$ (Product Rule)

4. $\dfrac{d}{dx}\left[\dfrac{u}{v}\right] = \dfrac{vu' - uv'}{v^2}$

5. $\dfrac{d}{dx}[c] = 0$

6. $\dfrac{d}{dx}[u^n] = nu^{n-1}u'$

7. $\dfrac{d}{dx}[x] = 1$

8. $\dfrac{d}{dx}[|u|] = \dfrac{u}{|u|}(u'), \quad u \neq 0$

9. $\dfrac{d}{dx}[\ln u] = \dfrac{u'}{u}$

10. $\dfrac{d}{dx}[e^u] = e^u u'$

11. $\dfrac{d}{dx}[\sin u] = (\cos u)u'$

12. $\dfrac{d}{dx}[\cos u] = -(\sin u)u'$

13. $\dfrac{d}{dx}[\tan u] = (\sec^2 u)u'$

14. $\dfrac{d}{dx}[\cot u] = -(\csc^2 u)u'$

15. $\dfrac{d}{dx}[\sec u] = (\sec u \tan u)u'$

16. $\dfrac{d}{dx}[\csc u] = -(\csc u \cot u)u'$

17. $\dfrac{d}{dx}\left[\sin^{-1} u\right] = \dfrac{u'}{\sqrt{1-u^2}}$

18. $\dfrac{d}{dx}\left[\cos^{-1} u\right] = -\dfrac{u'}{\sqrt{1-u^2}}$

19. $\dfrac{d}{dx}\left[\tan^{-1} u\right] = \dfrac{u'}{1+u^2}$

20. $\dfrac{d}{dx}\left[\cot^{-1} u\right] = -\dfrac{u'}{1+u^2}$

21. $\dfrac{d}{dx}\left[\sec^{-1} u\right] = \dfrac{u'}{u\sqrt{u^2-1}}$

22. $\dfrac{d}{dx}\left[\csc^{-1} u\right] = -\dfrac{u'}{|u|\sqrt{u^2-1}}$

Basic Integration Formulas

1. $\displaystyle\int kf(u)\,du = k\int f(u)\,du$

2. $\displaystyle\int [f(u) \pm g(u)]\,du = \int f(u)\,du \pm \int g(u)\,du$

3. $\displaystyle\int du = u + C$

4. $\displaystyle\int u^n\,du = \dfrac{u^{n+1}}{n+1} + C, \quad n \neq -1$

5. $\displaystyle\int \dfrac{du}{u} = \ln|u| + C$

6. $\displaystyle\int e^u\,du = e^u + C$

7. $\displaystyle\int \sin u\,du = -\cos u + C$

8. $\displaystyle\int \cos u\,du = \sin u + C$

9. $\displaystyle\int \tan u\,du = -\ln|\cos u| + C$

10. $\displaystyle\int \cot u\,du = \ln|\sin u| + C$

11. $\displaystyle\int \sec u\,du = \ln|\sec u + \tan u| + C$

12. $\displaystyle\int \csc u\,du = -\ln|\csc u + \cot u| + C$

13. $\displaystyle\int \sec^2 u\,du = \tan u + C$

14. $\displaystyle\int \csc^2 u\,du = -\cot u + C$

15. $\displaystyle\int \sec u \tan u\,du = \sec u + C$

16. $\displaystyle\int \csc u \cot u\,du = -\csc u + C$

17. $\displaystyle\int \dfrac{du}{\sqrt{a^2 - u^2}} = \sin^{-1}\dfrac{u}{a} + C$

18. $\displaystyle\int \dfrac{du}{a^2 + u^2} = \dfrac{1}{a}\tan^{-1}\dfrac{u}{a} + C$

19. $\displaystyle\int \dfrac{du}{u\sqrt{u^2 - a^2}} = \dfrac{1}{a}\sec^{-1}\dfrac{u}{a} + C$