

Differentiation

1. $\frac{d(cu)}{dx} = c \frac{du}{dx},$
2. $\frac{d(u+v)}{dx} = \frac{du}{dx} + \frac{dv}{dx},$
3. $\frac{d(uv)}{dx} = u \frac{dv}{dx} + v \frac{du}{dx},$
4. $\frac{d(u^n)}{dx} = nu^{n-1} \frac{du}{dx},$
5. $\frac{d(u/v)}{dx} = \frac{v(\frac{du}{dx}) - u(\frac{dv}{dx})}{v^2},$
6. $\frac{d(e^{cu})}{dx} = ce^{cu} \frac{du}{dx},$
7. $\frac{d(c^u)}{dx} = (\ln c)c^u \frac{du}{dx},$
8. $\frac{d(\ln u)}{dx} = \frac{1}{u} \frac{du}{dx},$
9. $\frac{d(\sin u)}{dx} = \cos u \cdot \frac{du}{dx},$
10. $\frac{d(\cos u)}{dx} = -\sin u \cdot \frac{du}{dx},$
11. $\frac{d(\tan u)}{dx} = \sec^2 u \cdot \frac{du}{dx},$
12. $\frac{d(\cot u)}{dx} = \csc^2 u \cdot \frac{du}{dx},$
13. $\frac{d(\sec u)}{dx} = \tan u \sec u \cdot \frac{du}{dx},$
14. $\frac{d(\csc u)}{dx} = -\cot u \csc u \cdot \frac{du}{dx},$
15. $\frac{d(\arcsin u)}{dx} = \frac{1}{\sqrt{1-u^2}} \frac{du}{dx},$
16. $\frac{d(\arccos u)}{dx} = \frac{-1}{\sqrt{1-u^2}} \frac{du}{dx},$
17. $\frac{d(\arctan u)}{dx} = \frac{1}{1+u^2} \frac{du}{dx},$
18. $\frac{d(\text{arccot } u)}{dx} = \frac{-1}{1+u^2} \frac{du}{dx},$
19. $\frac{d(\text{arcsec } u)}{dx} = \frac{1}{u\sqrt{1-u^2}} \frac{du}{dx},$
20. $\frac{d(\text{arccsc } u)}{dx} = \frac{-1}{u\sqrt{1-u^2}} \frac{du}{dx},$

¹arcsin, arccos, arctan, arcsec, arccsc and arccot are the *inverse* trigonometric functions of sin, cos, tan, sec, csc and cot respectively. For example, if $\arcsin y = \theta$, then $\sin \theta = y$. Here θ is in radian.

Integration

- $\int cu \, dx = c \int u \, dx,$
- $\int (u + v) \, dx = \int u \, dx + \int v \, dx,$
- $\int x^n \, dx = \frac{1}{n+1} x^{n+1}, \quad n \neq -1,$
- $\int \frac{1}{x} \, dx = \ln x,$
- $\int e^x \, dx = e^x,$
- $\int \frac{dx}{1+x^2} = \arctan x,$
- $\int u \frac{dv}{dx} \, dx = uv - \int v \frac{du}{dx} \, dx,$
- $\int \sin x \, dx = -\cos x,$
- $\int \cos x \, dx = \sin x,$
- $\int \tan x \, dx = -\ln |\cos x|,$
- $\int \cot x \, dx = \ln |\cos x|,$
- $\int \sec x \, dx = \ln |\sec x + \tan x|,$
- $\int \csc x \, dx = \ln |\csc x + \cot x|,$
- $\int \arcsin \frac{x}{a} \, dx = \arcsin \frac{x}{a} + \sqrt{a^2 - x^2}, \quad a > 0,$
- $\int \arccos \frac{x}{a} \, dx = \arccos \frac{x}{a} - \sqrt{a^2 - x^2}, \quad a > 0,$
- $\int \arctan \frac{x}{a} \, dx = x \arctan \frac{x}{a} - \frac{a}{2} \ln(a^2 + x^2), \quad a > 0,$
- $\int \sin^2(ax) \, dx = \frac{1}{2a} (ax - \sin(ax) \cos(ax)),$
- $\int \cos^2(ax) \, dx = \frac{1}{2a} (ax + \sin(ax) \cos(ax)),$
- $\int \sec^2 x \, dx = \tan x,$
- $\int \csc^2 x \, dx = -\cot x,$