Differentiation formulae

1) $\frac{d}{dx}(x^n) = n x^{n-1}$

2) $\frac{d}{dx}(e^x) = e^x$

3) $\frac{d}{dx}(a^x) = a^x \log a$

4) $\frac{d}{dx}(\log x) = \frac{1}{x}$

5) $\frac{d}{dx}(\sin x) = \cos x$

6) $\frac{d}{dx}(\cos x) = -\sin x$

7) $\frac{d}{dx}(\tan x) = \sec^2 x$

8) $\frac{d}{dx}(\cot x) = -\operatorname{cosec}^2 x$

9) $\frac{d}{dx}(\sec x) = \sec x . \tan x$

10) $\frac{d}{dx}(\operatorname{cosec} x) = -\operatorname{cosec} x . \cot x$

11) $\frac{d}{dx}(\sin^{-1} x) = \frac{1}{\sqrt{1-x^2}}$

12) $\frac{d}{dx}(\cos^{-1} x) = \frac{-1}{\sqrt{1-x^2}}$

13) $\frac{d}{dx}(\tan^{-1} x) = \frac{1}{1+x^2}$

14) $\frac{d}{dx}(\cot^{-1} x) = \frac{-1}{1+x^2}$

15) $\frac{d}{dx}(\sec^{-1} x) = \frac{1}{x\sqrt{x^2-1}}$

16) $\frac{d}{dx}(\operatorname{cosec}^{-1} x) = \frac{-1}{x\sqrt{x^2-1}}$

17) $\frac{d}{dx}(\sinh x) = \cosh x$

18) $\frac{d}{dx}(\cosh x) = \sinh x$

19) $\frac{d}{dx}(\tanh x) = \operatorname{Sech}^2 x$

20) $\frac{d}{dx}(\operatorname{Sech} x) = \operatorname{Sech} x . \tanh x$

21) $\frac{d}{dx}(\coth x) = -\operatorname{cosech}^2 x$

22) $\frac{d}{dx}(\operatorname{cosech} x) = -\operatorname{cosech} x . \coth x$

23) If $y = u \pm v$, then

$$\frac{dy}{dx} = \frac{du}{dx} \pm \frac{dv}{dx}$$

24) If $y = u.v$, then

$$\frac{dy}{dx} = u.\frac{dv}{dx} + v.\frac{du}{dx}$$

25) If $y = \frac{u}{v}$, then

$$\frac{dy}{dx} = \frac{v.\frac{du}{dx} - u.\frac{dv}{dx}}{v^2}$$

26) If $y = x^x$, then

$$\frac{dy}{dx} = x^x(1 + \log x)$$

• Formulae List •

Integration Formulae

1) $\int x^n \, dx = \frac{x^{n+1}}{n+1} + c$

2) $\int \frac{dx}{x} = \log x + c$

3) $\int \sin x \, dx = -\cos x + c$

4) $\int \cos x \, dx = \sin x + c$

5) $\int \tan x \, dx = \log|\sec x| + c$

6) $\int \cot x \, dx = \log|\sin x| + c$

7) $\int \sec x \, dx = \log|\sec x + \tan x| + c$

8) $\int \operatorname{cosec} x \, dx = \log|\operatorname{cosec} x - \cot x| + c$

9) $\int e^x \, dx = e^x + c$

10) $\int a^x \, dx = \frac{a^x}{\log a} + c$

11) $\int \sinh x \, dx = \cosh x + c$

12) $\int \cosh x \, dx = \sinh x + c$

13) $\int \tanh x \, dx = \log(\cosh x) + c$

14) $\int \operatorname{sech} x \, dx = \sin^{-1}(\tanh x) + c$

15) $\int \coth x \, dx = \log|\sinh x| + c$

16) $\int \operatorname{cosech} x \, dx = \tan\left|\tanh \frac{x}{2}\right|$

17) $\int \frac{dx}{\sqrt{a^2 - x^2}} = \sin^{-1}\left(\frac{x}{a}\right) + c$

18) $\int \frac{dx}{\sqrt{x^2 - a^2}} = \log\left(x + \sqrt{x^2 - a^2}\right) + c$

19) $\int \frac{dx}{\sqrt{x^2 + a^2}} = \log\left(x + \sqrt{x^2 + a^2}\right) + c$

20) $\int \frac{dx}{x^2+a^2} = \frac{1}{a}\tan^{-1}\left(\frac{x}{a}\right)+c$

21) $\int \frac{dx}{x^2-a^2} = \frac{1}{2a}\log\left(\frac{x-a}{x+a}\right)+c$

22) $\int \frac{dx}{a^2-x^2} = \frac{1}{2a}\log\left(\frac{a+x}{a-x}\right)+c$

23) $\int e^{ax}\sin bx\,dx = \frac{1}{a^2+b^2}\cdot e^{ax}(a\sin bx - b\cos bx)+c$

24) $\int e^{ax}\cos bx\,dx = \frac{1}{a^2+b^2}\cdot e^{ax}(a\cos bx + b\sin bx)+c$

25) $\int \sqrt{a^2-x^2}\,dx = \frac{x}{2}\sqrt{a^2-x^2} + \frac{a^2}{2}\sin^{-1}\left(\frac{x}{a}\right)+c$

26) $\int \sqrt{x^2+a^2}\,dx = \frac{x}{2}\sqrt{x^2+a^2} + \frac{a^2}{2}\log\left(x+\sqrt{x^2+a^2}\right)+c$

27) $\int \sqrt{x^2-a^2}\,dx = \frac{x}{2}\sqrt{x^2-a^2} - \frac{a^2}{2}\log\left(x+\sqrt{x^2-a^2}\right)+c$

28) $\int uv\,dx = u\int v\,dx - \int\left[\int v\,dx\cdot\left(\frac{du}{dx}\right)\right]dx + c$

$= uv_1 - u'v_2$

29) $\int e^x\left[f(x)+f'(x)\right]dx = e^x f(x)+c$

30) $\int_a^b f(x)\,dx = \int_a^b f(a+b-x)\,dx$

• Formulae List •

Trigonometric Formulae

* Trigonometric Ratios :

1) $\sin\theta = \frac{\text{Opposite}}{\text{Hypotenous}}$

2) $\cos\theta = \frac{\text{Adjecent}}{\text{Hypotenous}}$

3) $\tan\theta = \frac{\sin\theta}{\cos\theta}$

4) $\cot\theta = \frac{\cos\theta}{\sin\theta}$

5) $\sec\theta = \frac{1}{\cos\theta}$

6) $\operatorname{cosec}\theta = \frac{1}{\sin\theta}$

* Trigonometric Identities :

1) $\sin^2\theta + \cos^2\theta = 1$

2) $1 + \tan^2\theta = \sec^2\theta$

3) $1 + \cot^2\theta = \operatorname{cosec}^2\theta$

4) $\sin(A \pm B) = \sin A . \cos B \pm \cos A . \sin B$

5) $\cos(A \pm B) = \cos A . \cos B \mp \sin A . \sin B$

6) $\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A . \tan B}$

* Double Angle Formulae :

1) $\sin 2\theta = 2 \sin\theta . \cos\theta$

$= \frac{2\tan\theta}{1 + \tan^2\theta}$

2) $\cos 2\theta = \cos^2\theta - \sin^2\theta$

$= 2\cos^2\theta - 1$

$= 1 - 2\sin^2\theta$

$$\cos 2\theta = \frac{1-\tan^2\theta}{1+\tan^2\theta}$$

3) $\tan 2\theta = \dfrac{2\tan\theta}{1-\tan^2\theta}$

* Triple Angle Formulae :

1) $\sin 3\theta = 3\sin\theta - 4\sin^3\theta$

2) $\cos 3\theta = 4\cos^3\theta - 3\cos\theta$

3) $\tan 3\theta = \dfrac{3\tan\theta - \tan^3\theta}{1-3\tan^2\theta}$

* Factorization & Defactorization :

1) $\sin C + \sin D = 2\sin\left(\frac{C+D}{2}\right).\cos\left(\frac{C-D}{2}\right)$

2) $\sin C - \sin D = 2\cos\left(\frac{C+D}{2}\right).\sin\left(\frac{C-D}{2}\right)$

3) $\cos C + \cos D = 2\cos\left(\frac{C+D}{2}\right).\cos\left(\frac{C-D}{2}\right)$

4) $\cos C - \cos D = -2\sin\left(\frac{C+D}{2}\right).\sin\left(\frac{C-D}{2}\right)$

5) $2\sin A.\cos B = [\sin(A+B) + \sin(A-B)]$

6) $2\cos A.\sin B = [\sin(A+B) - \sin(A-B)]$

7) $2\cos A.\cos B = [\cos(A+B) + \cos(A-B)]$

8) $-2\sin A.\sin B = [\cos(A+B) - \cos(A-B)]$

* Allied Angles :

1) $\sin(-\theta) = -\sin\theta$

2) $\cos(-\theta) = \cos\theta$

3) $\sin\left(\frac{\pi}{2}-\theta\right) = \cos\theta$

4) $\cos\left(\frac{\pi}{2}-\theta\right) = \sin\theta$

5) $\sin\left(\frac{\pi}{2}+\theta\right) = \cos\theta$

6) $\cos\left(\frac{\pi}{2}+\theta\right) = -\sin\theta$

7) $\sin(\pi-\theta) = \sin\theta$

8) $\cos(\pi-\theta) = -\cos\theta$

9) $\sin(\pi+\theta) = -\sin\theta$

10) $\cos(\pi+\theta) = -\cos\theta$

11) $\sin\left(\frac{3\pi}{2}-\theta\right) = -\cos\theta$

12) $\cos\left(\frac{3\pi}{2}-\theta\right) = -\sin\theta$

13) $\sin\left(\frac{3\pi}{2}+\theta\right) = -\cos\theta$

14) $\cos\left(\frac{3\pi}{2}+\theta\right) = \sin\theta$

* Hyperbolic Formulae :

1) $\sinh x = \frac{e^x - e^{-x}}{2}$

2) $\cosh x = \frac{e^x + e^{-x}}{2}$

3) $\tanh x = \frac{e^x - e^{-x}}{e^x + e^{-x}}$

4) $\coth x = \frac{e^x + e^{-x}}{e^x - e^{-x}}$

5) $\cosh^2 x - \sinh^2 x = 1$

6) $\operatorname{sech}^2 x = 1 - \tanh^2 x$

7) $\operatorname{cosech}^2 x = \coth^2 x - 1$

8) $\sinh 2x = 2\sinh x . \cosh x$

9) $\cosh 2x = 2\cosh^2 x - 1$

$= 2\sinh^2 x + 1$