

Trigonometric Functions

Relationship between Degrees and Radians

radian = 원(圓)에서 반지름과 같은 길이의 호에 대한 각도

$$2\pi \text{ radian} = 360^\circ$$

$$1 \text{ radian} = 180^\circ/\pi = 57.29577\ 95130\ 8232\dots^\circ$$

$$1^\circ = \pi/180 \text{ radians} = 0.01745\ 32925\ 19943\ 29576\ 92\dots \text{radians}$$

Relationship among Trigonometric Functions

$$\tan A = \frac{\sin A}{\cos A}$$

$$\sin^2 A + \cos^2 A = 1$$

$$\cot A = \frac{1}{\tan A} = \frac{\cos A}{\sin A}$$

$$\sec A = \frac{1}{\cos A}$$

$$\csc A = \frac{1}{\sin A}$$

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

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

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

$$\cot(A \pm B) = \frac{\cot A \cot B \mp 1}{\cot B \pm \cot A}$$

Definition of Hyperbolic function(쌍곡선함수)

$$\text{Hyperbolic sine of } x = \sinh x = \frac{e^x - e^{-x}}{2}$$

$$\text{Hyperbolic cosine of } x = \cosh x = \frac{e^x + e^{-x}}{2}$$

Exponential and Logarithmic Functions

Laws of Exponents(지수법칙)

$$a^p \cdot a^q = a^{p+q}$$

$$a^p / a^q = a^{p-q}$$

$$(a^p)^q = a^{pq}$$

$$a^0 = 1, a \neq 0$$

$$a^{-p} = 1/a^p$$

$$(ab)^p = a^p b^p$$

$$\sqrt[n]{a} = a^{1/n}$$

$$\sqrt[n]{a^m} = a^{m/n}$$

$$\sqrt[n]{a/b} = \sqrt[n]{a} / \sqrt[n]{b}$$

Laws of Logarithms(로그법칙)

$$\log_a MN = \log_a M + \log_a N$$

$$\log_a \frac{M}{N} = \log_a M - \log_a N$$

$$\log_a M^p = p \log_a M$$

Relationship between Exponential and trigonometric functions (삼각함수와 지수의 관계)

$$e^{i\theta} = \cos \theta + i \sin \theta, e^{-i\theta} = \cos \theta - i \sin \theta$$

$$\sin \theta = \frac{e^{i\theta} - e^{-i\theta}}{2i}$$

$$\cos \theta = \frac{e^{i\theta} + e^{-i\theta}}{2i}$$

$$\tan \theta = \frac{e^{i\theta} - e^{-i\theta}}{i(e^{i\theta} + e^{-i\theta})} = -i \frac{e^{i\theta} - e^{-i\theta}}{(e^{i\theta} + e^{-i\theta})}$$

Periodicity of Exponential Functions (지수함수의 주기)

$$e^{i(\theta + 2k\pi)} = e^{i\theta} \quad k=\text{integer(정수)}$$

Derivatives(도함수)

Definition of a Derivative

$$\frac{dy}{dx} = \lim_{\Delta x \rightarrow 0} \frac{f(x + \Delta x) - f(x)}{\Delta x}$$

General rules of Differentiation(미분의 일반적 법칙)

$$\frac{d}{dx}(c) = 0$$

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

$$\frac{d}{dx}(uv) = u \frac{dv}{dx} + v \frac{du}{dx}$$

$$\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v(du/dx) - u(dv/dx)}{v^2}$$

$$\frac{d}{dx}(u^n) = nu^{n-1} \frac{du}{dx}$$

$$\frac{dy}{dx} = \frac{dy}{du} \frac{du}{dx} \quad (\text{chain rule})$$

$$\frac{du}{dx} = \frac{1}{dx/du}$$

General rules of Integrals(적분의 일반적 법칙)

$$\int a dx = ax$$

$$\int a f(x) dx = a \int f(x) dx$$

$$\int (u \pm v \pm w \dots) dx = \int u dx \pm \int v dx \pm \int w dx \pm \dots$$

$$\int u dx = uv - \int v du \quad (\text{Integration by parts})$$

$$\int f(ax) dx = \frac{1}{a} \int f(u) du$$

$$\int u^n du = \frac{u^{n+1}}{n+1}, \quad n \neq -1$$

$$\int \frac{du}{u} = \ln u \quad \text{if } u > 0 \quad \text{or } \ln(-u) \quad \text{if } u < 0$$

$$= \ln |u|$$

$$\int e^u du = e^u$$