Formulas

Additive property of equality

$$a = b \rightarrow a + c = b + c$$

Multiplicative property of equality

$$a = b \rightarrow ac = bc$$

Equations with absolute value

$$|ax + b| = c$$

$$ax + b = c$$

$$ax + b = -c$$

Formulas

The sense of inequality does not change if a number is added or subtracted from its two members.

$$a > b \rightarrow a + c > b + c \rightarrow a - c > b - c$$

The sense of inequality does not change if a positive number is multiplied or divided to its two members.

$$a > b \rightarrow ac > bc \rightarrow \frac{a}{c} > \frac{b}{c}$$

The sense of inequality is reversed if a negative number is multiplied or divided to its two members.

$$a > b \rightarrow ac < bc \rightarrow \frac{a}{c} < \frac{b}{c}$$

Exponents

$$a > b \rightarrow a^{c} > b^{c}$$

$$a^{(-c)} < b^{(-c)}$$

Transitive property

$$a > b \text{ and } b > c \rightarrow a > c$$

$$a < b \text{ and } b < c \rightarrow a < c$$

Property of non - negativity

$$a^{2} \geq 0$$

Property of the reciprocal

Formulas

Summation theorems

Be m and n positive integers, and c a constant.

$$\sum_{i=1}^{n} cf(i) = c\sum_{i=1}^{n} f(i)$$

$$\sum_{i=1}^{n}[f(i) \pm g(i)] = \sum_{i=1}^{n} f(i) \pm \sum_{i=1}^{n} g(i)$$

$$\sum_{i=1}^{n} f(i) = \sum_{i=1}^{m} f(i) + \sum_{i=m+1}^{n} f(i)$$

$$\sum_{i=1}^{n} c = nc$$

$$\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$$

$$\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}$$

$$\sum_{i=1}^{n} i^3 = \left[\frac{n(n+1)}{2}\right]^2$$

Properties of complex numbers

$$z + w = w + z$$

$$zw = wz$$

$$v + (w + z) = (v + w) + z$$

$$v(wz) = (vw)z$$

$$v(w + z) = vw + vz$$

$$(w + z)v = wv + zv$$

$$z + 0 = 0 + z = z$$

$$z \cdot 1 = 1 \cdot z = z$$

$$z + (-z) = 0$$

$$z \cdot z^{-1} = 1$$

Powers of the imaginary unit

$$i = \sqrt{-1}$$

$$i^3 = -i$$

$$i^2 = -1$$

$$i^4 = 1$$

Formulas

Complex number

$$z = a + bi$$

Modulus

$$r = |z| = \sqrt{a^2 + b^2}$$

Argument

$$\theta = \tan^{-1} \frac{b}{a}$$

Absolute value properties

$$|z| = 0 \rightarrow z = 0$$

$$|z + w| \leq |z| + |w|$$

$$|zw| = |z||w|$$

$$|z - w| \geq ||z| - |w||$$

Formulas

Trigonometric functions

$$\sin = \frac{\text{Opposite side}}{\text{Hypotenuse}} = \frac{CO}{H}$$

$$\cos = \frac{\text{Adjacent side}}{\text{Hypotenuse}} = \frac{CA}{H}$$

$$\tan = \frac{\text{Opposite side}}{\text{Adjacent side}} = \frac{CO}{CA}$$

$$\cot = \frac{\text{Adjacent side}}{\text{Opposite side}} = \frac{CA}{CO} = \frac{1}{\tan}$$

$$\sec = \frac{\text{Hypotenuse}}{\text{Adjacent side}} = \frac{H}{CA} = \frac{1}{\cos}$$

$$\csc = \frac{\text{Hypotenuse}}{\text{Opposite side}} = \frac{H}{CO} = \frac{1}{\sin}$$

Formulas

	0°	30°	45°	60°	90°	180°	270°
sin α	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1	0	-1
cos α	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0	-1	0
tan α	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	-	0	-
cot α	-	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0	-	0
sec α	1	$\frac{2}{\sqrt{3}}$	$\frac{2}{\sqrt{2}}$	2	-	-1	-
csc α	-	2	$\frac{2}{\sqrt{2}}$	$\frac{2}{\sqrt{3}}$	1	-	-1

Formulas

Fundamental trigonometric identities

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

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

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

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

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

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

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

$$\tan^2\alpha + 1 = \sec^2\alpha$$

$$\cot^2\alpha + 1 = \csc^2\alpha$$

$$\sin\alpha \cdot \csc\alpha = 1$$

$$\cos\alpha \cdot \sec\alpha = 1$$

$$\tan\alpha \cdot \cot\alpha = 1$$

Formulas

Trigonometric identities of addition and subtraction of angles

$$\sin(\alpha + \beta) = \sin\alpha\cos\beta + \cos\alpha\sin\beta$$

$$\cos(\alpha + \beta) = \cos\alpha\cos\beta - \sin\alpha\sin\beta$$

$$\sin(\alpha - \beta) = \sin\alpha\cos\beta - \cos\alpha\sin\beta$$

$$\cos(\alpha - \beta) = \cos\alpha\cos\beta + \sin\alpha\sin\beta$$

$$\tan(\alpha + \beta) = \frac{\tan\alpha + \tan\beta}{1 - \tan\alpha\tan\beta}$$

$$\tan(\alpha - \beta) = \frac{\tan\alpha - \tan\beta}{1 + \tan\alpha\tan\beta}$$

Formulas

Double and Half Angle Trigonometric Identities

$$\sin 2\alpha = 2 \sin \alpha \cos \alpha$$

$$\cos 2\alpha = \cos^2 \alpha - \sin^2 \alpha$$

$$\cos 2\alpha = 1 - 2 \sin^2 \alpha$$

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

$$\tan 2\alpha = \frac{2 \tan \alpha}{1 - \tan^2 \alpha}$$

$$\sin \frac{\alpha}{2} = \pm\sqrt{\frac{1 - \cos \alpha}{2}}$$

$$\cos \frac{\alpha}{2} = \pm\sqrt{\frac{1 + \cos \alpha}{2}}$$

$$\tan \frac{\alpha}{2} = \pm\sqrt{\frac{1 - \cos \alpha}{1 + \cos \alpha}}$$

$$\tan \frac{\alpha}{2} = \frac{1 - \cos \alpha}{\sin \alpha} = \frac{\sin \alpha}{1 + \cos \alpha}$$

Formulas

Sum - to - product trigonometric identities

$$\sin \alpha + \sin \beta = 2 \sin\left(\frac{\alpha + \beta}{2}\right) \cos\left(\frac{\alpha - \beta}{2}\right)$$

$$\sin \alpha - \sin \beta = 2 \sin\left(\frac{\alpha - \beta}{2}\right) \cos\left(\frac{\alpha + \beta}{2}\right)$$

$$\cos \alpha + \cos \beta = 2 \cos\left(\frac{\alpha + \beta}{2}\right) \cos\left(\frac{\alpha - \beta}{2}\right)$$

$$\cos \alpha - \cos \beta = -2 \sin\left(\frac{\alpha + \beta}{2}\right) \sin\left(\frac{\alpha - \beta}{2}\right)$$

Product - to - sum trigonometric identities

$$\sin \alpha \sin \beta = \frac{1}{2}[\cos(\alpha - \beta) - \cos(\alpha + \beta)]$$

$$\cos \alpha \cos \beta = \frac{1}{2}[\cos(\alpha - \beta) + \cos(\alpha + \beta)]$$

$$\sin \alpha \cos \beta = \frac{1}{2}[\sin(\alpha + \beta) + \sin(\alpha - \beta)]$$

Formulas

Even and odd trigonometric identities

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

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

Trigonometric Identities of supplement and complement

$$\sin(\pi \pm \theta) = \mp \sin\theta$$

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

$$\sin(\pi/2 - \theta) = \cos\theta$$

$$\cos(\pi/2 - \theta) = \sin\theta$$

Formulas

Law of sines

$$\frac{\sin a}{\sin \alpha} = \frac{\sin b}{\sin \beta} = \frac{\sin c}{\sin \gamma}$$

Symbology

a, b, c = sides of the spherical triangle
α, β, γ = angles of the spherical triangle

Formulas

$$\sin(0) = 0$$

$$\sin\left[(2n \pm 1)\frac{\pi}{2}\right] = -(-1)^n = (-1)^{n+1}$$

$$\sin(\pi) = 0$$

$$\cos\left[(2n \pm 1)\frac{\pi}{2}\right] = 0$$

$$\sin(2\pi) = 0$$

$$\sin(-n\pi) = -\sin(n\pi) = 0$$

$$\sin(n\pi) = 0$$

$$\cos(-n\pi) = \cos(n\pi) = (-1)^n$$

$$\sin\left(\frac{\pi}{2}\right) = 1$$

$$\sin\left[(1 \pm 4n)\frac{\pi}{2}\right] = 1$$

$$\sin\left(\frac{3\pi}{2}\right) = -1$$

$$\cos\left[(1 \pm 4n)\frac{\pi}{2}\right] = 0$$

$$\cos\left(\frac{\pi}{2}\right) = 0$$

$$\sin(t) = \frac{1}{2j}\left(e^{jt} - e^{-jt}\right)$$

$$\cos\left(\frac{3\pi}{2}\right) = 0$$

$$\cos(t) = \frac{1}{2}\left(e^{jt} + e^{-jt}\right)$$

$$\cos(0) = 1$$

$$e^{\pm jt} = \cos(t) \pm j\sin(t)$$

$$\cos(\pi) = -1$$

$$\cos(2n - 1)\pi = -1$$

$$\cos(2\pi) = 1$$

$$\sin(2n - 1)\pi = 0$$

$$\cos(2n\pi) = 1$$

$$\cos(1 \pm n)\pi = -(-1)^n$$

Formulas

Surface of a spherical triangle

$$S = \frac{\pi r^2}{180^\circ}(\alpha + \beta + \gamma - 180^\circ)$$

Surface of a spherical polygon

$$S = \frac{\pi r^2}{180^\circ}(A_1 + A_2 + \cdots + A_n - (n-2) \cdot 180^\circ)$$

Symbology

r = radius of the sphere
α β γ = angles of the triangle
$A_1, A_2, \ldots, A_n$ = angles of the polygon
n = number of sides of the polygon

Cosine rule for sides

$$\cos a = \cos b \cos c + \sin b \sin c \cos \alpha$$

$$\cos b = \cos a \cos c + \sin a \sin c \cos \beta$$

$$\cos c = \cos a \cos b + \sin a \sin b \cos \gamma$$

Σ Symbology

a, b, c = sides of the spherical triangle
α, β, γ = angles of the spherical triangle

Cotangent theorem

$$\cot a \sin b = \cos b \cos \gamma + \sin \gamma \cot \alpha$$

$$\cot a \sin c = \cos c \cos \beta + \sin \beta \cot \alpha$$

$$\cot b \sin a = \cos a \cos \gamma + \sin \gamma \cot \beta$$

$$\cot b \sin c = \cos c \cos \alpha + \sin \alpha \cot \beta$$

$$\cot c \sin a = \cos a \cos \beta + \sin \beta \cot \gamma$$

$$\cot c \sin b = \cos b \cos \alpha + \sin \alpha \cot \gamma$$

Σ Symbology

a, b, c = sides of the spherical triangle
α, β, γ = angles of the spherical triangle

Half - angle

$$p = \frac{a+b+c}{2}$$

$$\sin\frac{\alpha}{2} = \sqrt{\frac{\sin(p-b)\sin(p-c)}{\sin b \sin c}}$$

$$\cos\frac{\alpha}{2} = \sqrt{\frac{\sin p \sin(p-a)}{\sin b \sin c}}$$

$$\tan\frac{\alpha}{2} = \sqrt{\frac{\sin(p-b)\sin(p-c)}{\sin p \sin(p-a)}}$$

Σ Symbology

a, b, c = sides of the spherical triangle
α, β, γ = angles of the spherical triangle

Properties of limits

$$\lim_{x \to c} k = k$$

$$\lim_{x \to c} k f(x) = k \lim_{x \to c} f(x)$$

$$\lim_{x \to c} [f(x) + g(x)] = \lim_{x \to c} f(x) + \lim_{x \to c} g(x)$$

$$\lim_{x \to c} [f(x) - g(x)] = \lim_{x \to c} f(x) - \lim_{x \to c} g(x)$$

$$\lim_{x \to c} [f(x) \cdot g(x)] = \lim_{x \to c} f(x) \cdot \lim_{x \to c} g(x)$$

$$\lim_{x \to c} \left[\frac{f(x)}{g(x)} \right] = \frac{\lim_{x \to c} f(x)}{\lim_{x \to c} g(x)}$$

$$\lim_{x \to c} [f(x)^{g(x)}] = \lim_{x \to c} f(x)^{\lim_{x \to c} g(x)}$$

$$\lim_{x \to c} \log f(x) = \log \lim_{x \to c} f(x)$$

Lateral limits

$\lim_{x \to c} f(x) = L$ if and only if

$$\lim_{x \to c^+} f(x) = L$$

$$\lim_{x \to c^-} f(x) = L$$

Limits to infinity

$$\lim_{x \to +\infty} \frac{k}{x^n} = 0$$

Properties of trigonometric limits

$$\lim_{x\to 0} \frac{\sin x}{x} = 1$$

$$\lim_{x\to 0} \frac{x}{\sin x} = 1$$

$$\lim_{x\to 0} \sin x = 0$$

$$\lim_{x\to 0} \frac{\sin kx}{kx} = 1$$

$$\lim_{x\to 0} \cos x = 1$$

$$\lim_{x\to 0} \frac{1 - \cos x}{x} = 0$$

$$\lim_{x\to 0} \frac{1 - \cos x}{x^2} = \frac{1}{2}$$

$$\lim_{x\to 0} \frac{\tan x}{x} = 1$$

$$\lim_{x\to 0} \frac{x}{\tan x} = 1$$

$$\lim_{x\to 0} \frac{\tan kx}{kx} = 1$$

Definition of the derivative of a function

$$f'(x) = \lim_{\Delta x \to 0} \frac{f(x + \Delta x) - f(x)}{\Delta x}$$

Basic derivative rules

$$y = c \qquad y' = 0$$

$$y = x \qquad y' = 1$$

$$y = x^n \qquad y' = nx^{n-1}$$

$$y = cf(x) \qquad y' = cf'(x)$$

$$y = u \pm v \qquad y' = u' \pm v'$$

$$y = uv \qquad y' = u'v + uv'$$

$$y = \frac{u}{v} \qquad y' = \frac{u'v - uv'}{v^2}$$

$$y = u^n \qquad y' = nu^{n-1} \cdot u'$$

Formulas

u is a function that can be derived and u' is its derivative.

Natural logarithm

$$y = \ln u \qquad y' = \frac{1}{u} \cdot u'$$

Logarithm base *a*

$$y = \log_a u \qquad y' = \frac{1}{(\ln a)u} \cdot u'$$

Formulas

u is a function that can be derived, u' is its derivative and a is a constant.

Natural exponential

$$y = e^u \qquad y' = e^u \cdot u'$$

General exponential

$$y = a^u \qquad y' = a^u \ln a \cdot u'$$

Formulas

Derivatives of trigonometric functions

u is a function that can be derived and u' is its derivative.

$$y = \sin u \qquad y' = \cos u \cdot u'$$

$$y = \cos u \qquad y' = -\sin u \cdot u'$$

$$y = \tan u \qquad y' = \sec^2 u \cdot u'$$

$$y = \cot u \qquad y' = -\csc^2 u \cdot u'$$

$$y = \sec u \qquad y' = \sec u \tan u \cdot u'$$

$$y = \csc u \qquad y' = -\csc u \cot u \cdot u'$$

Derivatives of inverse trigonometric functions

u is a function that can be derived and u' is its derivative.

$$y = \sin^{-1} u \qquad y' = \frac{u'}{\sqrt{1-u^2}}$$

$$y = \cos^{-1} u \qquad y' = \frac{-u'}{\sqrt{1-u^2}}$$

$$y = \tan^{-1} u \qquad y' = \frac{u'}{1+u^2}$$

$$y = \cot^{-1} u \qquad y' = \frac{-u'}{1+u^2}$$

$$y = \sec^{-1} u \qquad y' = \frac{u'}{|u|\sqrt{u^2-1}}$$

$$y = \csc^{-1} u \qquad y' = \frac{-u'}{|u|\sqrt{u^2-1}}$$

Derivatives of hyperbolic functions

u is a function that can be derived and u' is its derivative.

$$y = \sinh u \qquad y' = \cosh u \cdot u'$$

$$y = \cosh u \qquad y' = \sinh u \cdot u'$$

$$y = \tanh u \qquad y' = \operatorname{sech}^2 u \cdot u'$$

$$y = \coth u \qquad y' = -\operatorname{csch}^2 u \cdot u'$$

$$y = \operatorname{sech} u \qquad y' = -\operatorname{sech} u \tanh u \cdot u'$$

$$y = \operatorname{csch} u \qquad y' = -\operatorname{csch} u \coth u \cdot u'$$

Formulas

Derivatives of inverse hyperbolic functions

u is a function that can be derived and u' is its derivative.

$$y = \sinh^{-1} u \qquad y' = \frac{u'}{\sqrt{u^2+1}}$$

$$y = \cosh^{-1} u \qquad y' = \frac{u'}{\sqrt{u^2-1}}$$

$$y = \tanh^{-1} u \qquad y' = \frac{u'}{1-u^2}$$

$$y = \coth^{-1} u \qquad y' = \frac{u'}{1-u^2}$$

$$y = \operatorname{sech}^{-1} u \qquad y' = \frac{-u'}{u\sqrt{1-u^2}}$$

$$y = \operatorname{csch}^{-1} u \qquad y' = \frac{-u'}{|u|\sqrt{1+u^2}}$$

Formulas

Criterion of the first derivative, increasing and decreasing functions

$$f'(x) > 0 \to f(x) \text{ Increasing}$$

$$f'(x) < 0 \to f(x) \text{ Decreasing}$$

$$f'(x) = 0 \to f(x) \text{ It's constant}$$

Criterion of the second derivative and concavity

$$f''(x) > 0 \to f(x) \text{ Concave upward}$$

$$f''(x) < 0 \to f(x) \text{ Concave downward}$$

Formulas

Basic integration rules

$$\int dx = x + C$$

$$\int k dx = kx + C$$

$$\int kf(x)dx = k \int f(x)dx$$

$$\int [f(x) \pm g(x)]dx = \int f(x)dx \pm \int g(x)dx$$

$$\int x^n dx = \frac{x^{n+1}}{n+1} + C$$

Formulas

Change of variables

It is used to make the integral simpler and directly apply the integration rules.

$$\int u^n du = \frac{u^{n+1}}{n+1} + C$$

$$\int \frac{du}{u} = \ln|u| + C$$

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

$$\int a^u du = \frac{a^u}{\ln a} + C$$

Formulas

Where u is a function.

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

$$\int \cos u \, du = \sin u + C$$

$$\int \tan u \, du = \ln|\sec u| + C = -\ln|\cos u| + C$$

$$\int \cot u \, du = \ln|\sin u| + C = -\ln|\csc u| + C$$

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

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

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

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

$$\int \sec u \tan u \, du = \sec u + C$$

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

Formulas

Where u is a function.

$$\int \sinh u \, du = \cosh u + C$$

$$\int \cosh u \, du = \sinh u + C$$

$$\int \tanh u \, du = \ln|\cosh u| + C$$

$$\int \coth u \, du = \ln|\sinh u| + C$$

$$\int \operatorname{sech}^2 u \, du = \tanh u + C$$

$$\int \operatorname{csch}^2 u \, du = -\coth u + C$$

$$\int \operatorname{sech} u \tanh u \, du = -\operatorname{sech} u + C$$

$$\int \operatorname{csch} u \coth u \, du = -\operatorname{csch} u + C$$

Formulas

Where a is a constant.

$$\int \frac{du}{\sqrt{a^2 - u^2}} = \sin^{-1}\frac{u}{a} + C$$

$$\int \frac{du}{a^2 + u^2} = \frac{1}{a}\tan^{-1}\frac{u}{a} + C$$

$$\int \frac{du}{u\sqrt{u^2 - a^2}} = \frac{1}{a}\sec^{-1}\frac{u}{a} + C$$

Formulas

Where a is a constant.

$$\int \frac{du}{\sqrt{a^2 + u^2}} = \sinh^{-1} \frac{u}{a} + C$$

$$\int \frac{du}{\sqrt{u^2 - a^2}} = \cosh^{-1} \frac{u}{a} + C$$

$$\int \frac{du}{a^2 - u^2} = \frac{1}{a} \tanh^{-1} \frac{u}{a} + C$$

$$\int \frac{du}{u\sqrt{a^2 - u^2}} = -\frac{1}{a} \operatorname{sech}^{-1} \frac{u}{a} + C$$

$$\int \frac{du}{u\sqrt{a^2 + u^2}} = -\frac{1}{a} \operatorname{csch}^{-1} \frac{u}{a} + C$$

Formulas

Where a is a constant.

$$\int \frac{du}{\sqrt{a^2+u^2}} = \sinh^{-1}\frac{u}{a} + C$$

$$\int \frac{du}{\sqrt{u^2-a^2}} = \cosh^{-1}\frac{u}{a} + C$$

$$\int \frac{du}{a^2-u^2} = \frac{1}{a}\tanh^{-1}\frac{u}{a} + C$$

$$\int \frac{du}{u\sqrt{a^2-u^2}} = -\frac{1}{a}\operatorname{sech}^{-1}\frac{u}{a} + C$$

$$\int \frac{du}{u\sqrt{a^2+u^2}} = -\frac{1}{a}\operatorname{csch}^{-1}\frac{u}{a} + C$$

Formulas

Fundamental theorem of calculus

$$\int_a^b f(x)dx = F(x)]_a^b = F(b) - F(a)$$

Properties of the definite integral

$$\int_b^a f(x)dx = -\int_a^b f(x)dx$$

$$\int_a^a f(x)dx = 0$$

$$\int_a^b kf(x)dx = k\int_a^b f(x)dx$$

$$\int_a^b [f(x) \pm g(x)]dx = \int_a^b f(x)dx \pm \int_a^b g(x)dx$$

$$\int_a^b f(x)dx = \int_a^k f(x)dx + \int_k^b f(x)dx$$

Formulas

Integration by parts

$$\int u \cdot dv = u \cdot v - \int v \cdot du$$

Notes

Where *u* and *v* will take the values according to the order in which they appear:

1. Logarithmic
2. Inverse trigonometric
3. Algebraic
4. Trigonometric
5. Exponential

Formulas

Applies when the integrator has one of the expressions of the form:

$$\sqrt{a^2 - u^2}, \sqrt{a^2 + u^2}, \sqrt{u^2 - a^2}$$

Expression in the integrating	Trigonometric substitution	The root is replaced by
$\sqrt{a^2 - u^2}$	$u = a \sin\theta$	$a\cos\theta$
$\sqrt{a^2 + u^2}$	$u = a \tan\theta$	$a\sec\theta$
$\sqrt{u^2 - a^2}$	$u = a \sec\theta$	$a\tan\theta$

Formulas

Integration by partial fractions

Case I. Different linear factors

Factor form

$$ax + b$$

Partial fraction

$$\frac{A}{ax + b}$$

Case II. Repeated linear factors

Factor form

$$(ax + b)^k$$

Partial fraction

$$\frac{A_1}{ax + b} + \frac{A_2}{(ax + b)^2} + \cdots + \frac{A_k}{(ax + b)^k}$$

Case III. Different quadratic factors

Factor form

$$ax^2 + bx + c$$

Partial fraction

$$\frac{Ax + B}{ax^2 + bx + c}$$

Formulas

If $\vec{R}(t) = f(t)\hat{\mathbf{i}} + g(t)\hat{\mathbf{j}}$ is a vector function.

Limit

$$\lim_{t \to t_1} \vec{R}(t) = \left[\lim_{t \to t_1} f(t)\right]\hat{\mathbf{i}} + \left[\lim_{t \to t_1} g(t)\right]\hat{\mathbf{j}}$$

Derivative

$$\vec{R}'(t) = \lim_{t \to 0} \frac{\vec{R}(t + \Delta t) - \vec{R}(t)}{\Delta t}$$

$$\vec{R}'(t) = f'(t)\hat{\mathbf{i}} + g'(t)\hat{\mathbf{j}}$$

Integral

$$\int_a^b \vec{R}(t)dt = \left[\int_a^b f(t)dt\right]\hat{\mathbf{i}} + \left[\int_a^b g(t)dt\right]\hat{\mathbf{j}}$$