$$\sin^2 x + \cos^2 x = 1$$
$$\sin(x \pm y) = \sin x \cos y \pm \cos x \sin y$$
$$\cos(x \pm y) = \cos x \cos y \mp \sin x \sin y$$
$$\sin 2x = 2 \sin x \cos x$$
$$\cos 2x = \cos^2 x - \sin^2 x$$
$$\tan(x \pm y) = \frac{\tan x \pm \tan y}{1 \mp \tan x \tan y}$$
$$\sin x + \sin y = 2 \sin \frac{x+y}{2} \cos \frac{x-y}{2}$$
$$\cos x + \cos y = 2 \cos \frac{x+y}{2} \cos \frac{x-y}{2}$$
$$\sin x \sin y = -\frac{1}{2} \left[\cos(x+y) - \cos(x-y)\right]$$
$$\sin x \cos y = \frac{1}{2} \left[\sin(x+y) + \sin(x-y)\right]$$
$$\cos x \cos y = \frac{1}{2} \left[\cos(x+y) + \cos(x-y)\right]$$
$$\cos x = \frac{e^{ix} + e^{-ix}}{2}$$
$$\sin x = \frac{e^{ix} - e^{-ix}}{2i}$$

$$\cosh^2 x - \sinh^2 x = 1$$
$$\sinh 2x = 2 \sinh x \cosh x$$
$$\cosh 2x = \cosh^2 x + \sinh^2 x$$
$$\cosh x = \frac{e^x + e^{-x}}{2}$$
$$\sinh x = \frac{e^x - e^{-x}}{2}$$
$$\operatorname{arsinh} x = \ln\left(x + \sqrt{x^2+1}\right)$$
$$\operatorname{arcosh} x = \ln\left(x + \sqrt{x^2-1}\right)$$
$$\operatorname{artanh} x = \frac{1}{2} \ln \frac{1+x}{1-x}$$
$$\operatorname{arcoth} x = \frac{1}{2} \ln \frac{x+1}{x-1}$$

$$(cf)' = cf'$$
$$(f \pm g)' = f' \pm g'$$
$$(fg)' = f'g + fg'$$
$$\left(\frac{f}{g}\right)' = \frac{f'g - fg'}{g^2}$$
$$(f \circ g)' = (f' \circ g)g'$$

$$(x^\alpha)' = \alpha x^{\alpha-1}$$
$$(a^x)' = (\ln a) a^x$$
$$(\log_a x)' = \frac{1}{\ln a} \frac{1}{x}$$
$$(\sin x)' = \cos x$$
$$(\cos x)' = -\sin x$$
$$(\tan x)' = \frac{1}{\cos^2 x} = 1 + \tan^2 x$$
$$(\cot x)' = -\frac{1}{\sin^2 x} = -1 - \cot^2 x$$
$$(\arcsin x)' = -(\arccos x)' = \frac{1}{\sqrt{1-x^2}}$$
$$(\arctan x)' = -(\operatorname{arccot} x)' = \frac{1}{1+x^2}$$
$$(\sinh x)' = \cosh x$$
$$(\cosh x)' = \sinh x$$
$$(\tanh x)' = \frac{1}{\cosh^2 x} = 1 - \tanh^2 x$$
$$(\coth x)' = -\frac{1}{\sinh^2 x} = 1 - \coth^2 x$$
$$(\operatorname{arsinh} x)' = \frac{1}{\sqrt{x^2+1}}$$
$$(\operatorname{arcosh} x)' = \frac{1}{\sqrt{x^2-1}}$$
$$(\operatorname{artanh} x)' = \frac{1}{1-x^2}$$
$$(\operatorname{arcoth} x)' = \frac{1}{1-x^2}$$

$$\int cf(x)\mathrm{d}x = c\int f(x)\mathrm{d}x$$
$$\int (f(x) \pm g(x))\mathrm{d}x = \int f(x)\mathrm{d}x \pm \int g(x)\mathrm{d}x$$
$$\int f'(ax+b)\mathrm{d}x = \frac{1}{a} f(ax+b) + C$$
$$\int f^\alpha(x) f'(x)\mathrm{d}x = \begin{cases} \frac{f^{\alpha+1}}{\alpha+1} + C & (\alpha \neq -1) \\ \ln|f(x)| + C & (\alpha = -1) \end{cases}$$
$$\int f(x)g'(x)\mathrm{d}x = f(x)g(x) - \int f'(x)g(x)\mathrm{d}x$$

$$t = \tan \frac{x}{2} \qquad \sin x = \frac{2t}{1+t^2}$$
$$\frac{\mathrm{d}x}{\mathrm{d}t} = \frac{2}{1+t^2} \qquad \cos x = \frac{1-t^2}{1+t^2}$$
$$u = \tanh \frac{x}{2} \qquad \sinh x = \frac{2u}{1-u^2}$$
$$\frac{\mathrm{d}x}{\mathrm{d}u} = \frac{2}{1-u^2} \qquad \cosh x = \frac{1+u^2}{1-u^2}$$

$$e^x = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \cdots + \frac{x^n}{n!} + \cdots$$
$$\cos x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \cdots + (-1)^n \frac{x^{2n}}{(2n)!} + \cdots$$
$$\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \cdots + (-1)^{n-1} \frac{x^{2n-1}}{(2n-1)!} + \cdots$$
$$\cosh x = 1 + \frac{x^2}{2!} + \frac{x^4}{4!} + \frac{x^6}{6!} + \cdots + \frac{x^{2n}}{(2n)!} + \cdots$$
$$\sinh x = x + \frac{x^3}{3!} + \frac{x^5}{5!} + \frac{x^7}{7!} + \cdots + \frac{x^{2n-1}}{(2n-1)!} + \cdots$$
$$\frac{1}{1-x} = 1 + x + x^2 + x^3 + \cdots + x^n + \cdots$$
$$(1+x)^\alpha = 1 + \alpha x + \frac{\alpha(\alpha-1)}{2} x^2 + \cdots + \binom{\alpha}{n} x^n + \cdots$$

$$(1+x)^n \geq 1+nx \qquad \det A = \sum_{i=1}^{n} (-1)^{i+j} a_{ij} \det A_{ij}$$

$$\binom{\alpha}{n} = \frac{\alpha(\alpha-1)\cdots(\alpha-n+1)}{n!}$$

$$\frac{n}{\frac{1}{a_1}+\frac{1}{a_2}+\cdots+\frac{1}{a_n}} \leq \sqrt[n]{a_1 a_2 \cdots a_n} \leq \frac{a_1+a_2+\cdots+a_n}{n} \leq \sqrt{\frac{a_1^2+a_2^2+\cdots+a_n^2}{n}}$$

$$\operatorname{grad} f = \frac{\partial f}{\partial x}\mathbf{i} + \frac{\partial f}{\partial y}\mathbf{j} + \frac{\partial f}{\partial z}\mathbf{k}$$

$$\operatorname{div} \mathbf{u} = \frac{\partial u_x}{\partial x} + \frac{\partial u_y}{\partial y} + \frac{\partial u_z}{\partial z}$$

$$D\mathbf{u} = \begin{bmatrix} \frac{\partial u_x}{\partial x} & \frac{\partial u_x}{\partial y} & \frac{\partial u_x}{\partial z} \\ \frac{\partial u_y}{\partial x} & \frac{\partial u_y}{\partial y} & \frac{\partial u_y}{\partial z} \\ \frac{\partial u_z}{\partial x} & \frac{\partial u_z}{\partial y} & \frac{\partial u_z}{\partial z} \end{bmatrix}$$

$$\operatorname{rot} \mathbf{u} = \begin{vmatrix} \mathbf{i} & \mathbf{j} & \mathbf{k} \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ u_x & u_y & u_z \end{vmatrix} = \left(\frac{\partial u_z}{\partial y} - \frac{\partial u_y}{\partial z}\right)\mathbf{i} + \left(\frac{\partial u_x}{\partial z} - \frac{\partial u_z}{\partial x}\right)\mathbf{j} + \left(\frac{\partial u_y}{\partial x} - \frac{\partial u_x}{\partial y}\right)\mathbf{k}$$

$$a_0 + \sum_{n=1}^{\infty} \left(a_n \cos\frac{2\pi n x}{T} + b_n \sin\frac{2\pi n x}{T}\right)$$

$$a_0 = \frac{1}{T}\int_0^T f(x)\mathrm{d}x$$

$$a_n = \frac{2}{T}\int_0^T f(x)\cos\frac{2\pi n x}{T}\mathrm{d}x$$

$$b_n = \frac{2}{T}\int_0^T f(x)\sin\frac{2\pi n x}{T}\mathrm{d}x$$

$$(\mathcal{L}f)(z) = \int_0^\infty f(x)e^{-zx}\mathrm{d}x$$

$$(f*g)(x) = \int_0^x f(s)g(x-s)\mathrm{d}s$$

$h(x)$	$(\mathcal{L}h)(z)$
1	$\frac{1}{z}$
x^n	$\frac{n!}{z^{n+1}}$
$e^{\alpha x}$	$\frac{1}{z-\alpha}$
$\cos bx$	$\frac{z}{z^2+b^2}$
$\sin bx$	$\frac{b}{z^2+b^2}$
$\cosh bx$	$\frac{z}{z^2-b^2}$
$\sinh bx$	$\frac{b}{z^2-b^2}$

$$\int_C f\,\mathrm{d}s = \int_a^b f(\mathbf{r}(t))|\dot{\mathbf{r}}(t)|\mathrm{d}t$$

$$\int_C \mathbf{u}\cdot\mathrm{d}\mathbf{r} = \int_a^b \mathbf{u}(\mathbf{r}(t))\cdot\dot{\mathbf{r}}(t)\mathrm{d}t$$

$$\iint_S f\,\mathrm{d}A = \iint_D f(\mathbf{r}(u,v))\left|\frac{\partial\mathbf{r}}{\partial u}\times\frac{\partial\mathbf{r}}{\partial v}\right|\mathrm{d}u\mathrm{d}v$$

$$\iint_S \mathbf{u}\cdot\mathrm{d}\mathbf{A} = \iint_D \mathbf{u}(\mathbf{r}(u,v))\cdot\left(\frac{\partial\mathbf{r}}{\partial u}\times\frac{\partial\mathbf{r}}{\partial v}\right)\mathrm{d}u\mathrm{d}v$$

$$\iiint_V f\,\mathrm{d}V = \iiint_D f(\mathbf{r}(u,v,w))\left|\frac{\partial\mathbf{r}}{\partial u}\frac{\partial\mathbf{r}}{\partial v}\frac{\partial\mathbf{r}}{\partial w}\right|\mathrm{d}u\mathrm{d}v\mathrm{d}w$$

$$\int_C \operatorname{grad} f\cdot\mathrm{d}\mathbf{r} = f(\mathbf{r}(b)) - f(\mathbf{r}(a))$$

$$\iint_S \operatorname{rot}\mathbf{u}\cdot\mathrm{d}\mathbf{A} = \int_{\partial S}\mathbf{u}\cdot\mathrm{d}\mathbf{r}$$

$$\iiint_V \operatorname{div}\mathbf{u}\,\mathrm{d}V = \iint_{\partial V}\mathbf{u}\cdot\mathrm{d}\mathbf{A}$$

$$\iint_{\partial V} f\operatorname{grad} g\cdot\mathrm{d}\mathbf{A} = \iiint_V (f\triangle g + \operatorname{grad} f\cdot\operatorname{grad} g)\mathrm{d}V$$

$$\iiint_V (f\triangle g - g\triangle f)\mathrm{d}V = \iint_{\partial V}(f\operatorname{grad} g - g\operatorname{grad} f)\cdot\mathrm{d}\mathbf{A}$$

$$\begin{aligned}
\operatorname{rot}\operatorname{grad} f &= 0 \\
\operatorname{div}\operatorname{rot}\mathbf{u} &= 0 \\
\operatorname{grad} cf &= c\operatorname{grad} f \\
\operatorname{div} c\mathbf{u} &= c\operatorname{div}\mathbf{u} \\
\operatorname{rot} c\mathbf{u} &= c\operatorname{rot}\mathbf{u} \\
\operatorname{grad}(f\pm g) &= \operatorname{grad} f \pm \operatorname{grad} g \\
\operatorname{div}(\mathbf{u}\pm\mathbf{v}) &= \operatorname{div}\mathbf{u} \pm \operatorname{div}\mathbf{v} \\
\operatorname{rot}(\mathbf{u}\pm\mathbf{v}) &= \operatorname{rot}\mathbf{u} \pm \operatorname{rot}\mathbf{v} \\
\operatorname{grad}(fg) &= (\operatorname{grad} f)g + f\operatorname{grad} g \\
\operatorname{div}(f\mathbf{u}) &= (\operatorname{grad} f)\cdot\mathbf{u} + f\operatorname{div}\mathbf{u} \\
\operatorname{rot}(f\mathbf{u}) &= (\operatorname{grad} f)\times\mathbf{u} + f\operatorname{rot}\mathbf{u} \\
\operatorname{grad}(\mathbf{u}\cdot\mathbf{v}) &= D\mathbf{u}(\mathbf{v}) + D\mathbf{v}(\mathbf{u}) + \mathbf{u}\times\operatorname{rot}\mathbf{v} + \mathbf{v}\times\operatorname{rot}\mathbf{u} \\
\operatorname{rot}(\mathbf{u}\times\mathbf{v}) &= D\mathbf{u}(\mathbf{v}) - D\mathbf{v}(\mathbf{u}) + (\operatorname{div}\mathbf{v})\cdot\mathbf{u} - (\operatorname{div}\mathbf{u})\cdot\mathbf{v} \\
\operatorname{div}(\mathbf{u}\times\mathbf{v}) &= (\operatorname{rot}\mathbf{u})\cdot\mathbf{v} - \mathbf{u}\cdot(\operatorname{rot}\mathbf{v})
\end{aligned}$$

$h(x)$	$(\mathcal{L}h)(z)$
$x^n f(x)$	$(-1)^n(\mathcal{L}f)^{(n)}(z)$
$e^{\alpha x}f(x)$	$(\mathcal{L}f)(z-\alpha)$
$f^{(n)}(x)$	$z^n(\mathcal{L}f)(z) - z^{n-1}f(0) - z^{n-2}f'(0) - \cdots - f^{(n-1)}(0)$
$(f*g)(x)$	$(\mathcal{L}f)(z)(\mathcal{L}g)(z)$

$$P(x,y) + Q(x,y)y' = 0$$

$$\ln|M(x)| = \int \frac{\frac{\partial P(x,y)}{\partial y} - \frac{\partial Q(x,y)}{\partial x}}{Q(x,y)}\mathrm{d}x$$

$$\ln|M(y)| = \int \frac{\frac{\partial Q(x,y)}{\partial x} - \frac{\partial P(x,y)}{\partial y}}{P(x,y)}\mathrm{d}y$$