FORMULAS

$$\frac{\partial u}{\partial x} = \frac{\partial v}{\partial y}; \qquad \frac{\partial u}{\partial y} = -\frac{\partial v}{\partial x};$$
$$\frac{\partial u}{\partial r} = \frac{1}{r}\frac{\partial v}{\partial \theta}; \qquad \frac{\partial v}{\partial r} = -\frac{1}{r}\frac{\partial u}{\partial \theta};$$

$$\cos z = \cos x \cosh y - i \sin x \sinh y; \qquad \sin z = \sin x \cosh y + i \cos x \sinh y.$$

$$e^w = \sum_{n=0}^{\infty} \frac{w^n}{n!}; \qquad \sin w = \sum_{n=0}^{\infty} \frac{(-1)^n w^{2n+1}}{(2n+1)!};$$
$$\cos w = \sum_{n=0}^{\infty} \frac{(-1)^n w^{2n}}{(2n)!}; \qquad \frac{1}{1-w} = \sum_{n=0}^{\infty} w^n, \ |w| < 1.$$

$$\text{Bilinear transformation:} \qquad w = \frac{az+b}{cz+d}.$$

$$f^{(n)}(a) = \frac{n!}{2\pi i} \oint_C \frac{f(z)}{(z-a)^{n+1}}\, dz$$

$$\oint_C = 2\pi i \sum_j \mathrm{Res}_{z=z_j} f(z); \qquad \mathrm{Res}_{z=a} f(z) = \frac{1}{(n-1)!} \lim_{z\to a} \frac{d^{n-1}}{dz^{n-1}} [(z-a)^n f(z)].$$
$$c_n = \frac{1}{2\pi i} \oint_C \frac{f(\zeta)}{(\zeta-a)^{n+1}}\, d\zeta.$$

$$\frac{d}{dx}\frac{\partial F}{\partial y'} = \frac{\partial F}{\partial y}; \qquad F - y'\frac{\partial F}{\partial y'} = C.$$

$$L = T - V; \qquad \frac{d}{dt}\frac{\partial L}{\partial \dot{q}_i} = \frac{\partial L}{\partial q_i} \quad i = 1, \ldots, n.$$