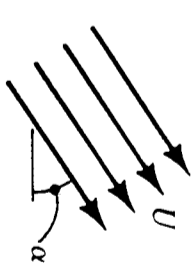
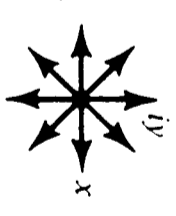
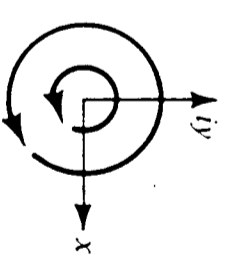


Table 12.2 Various Complex Potentials and Corresponding Flows

Complex Potential Ω $\Omega = \phi + i\psi$	Configuration	Flow Geometry
$Uze^{-i\alpha}$	Uniform flow in the direction α	
$\frac{q}{2\pi} \ln(z - z_0)$	Source located at z_0	
$\frac{-i\Gamma_x}{2\pi} \ln(z - z_0)$	Vortex located at z_0	
$\frac{qae^{i\alpha}}{\pi(z - z_0)}$	Doublet located at z_0	
Az^n	Flow in a corner of angle π/n	
$\frac{q}{2\pi} \ln \sinh \pi z/a$	Source at the center of a channel	
$Uz + \frac{q}{2\pi} \ln z$	Flow about a half body	
$U\left(z + \frac{b^2}{z}\right) + i\frac{\Gamma_x}{2\pi} \ln z$	Flow about a cylinder with circulation	
$Uz + \frac{q}{2\pi} \ln \frac{z+a}{z-a}$	Flow about a Rankine oval	
$\frac{i\Gamma_x}{2\pi} \ln \frac{z+a}{z-a}$	Line vortex near a wall	

Table 12.1 Table of Expressions for Elementary Flows (Fluid Mechanics, R. A. Gargner, Dowd Publ. N.Y.)

Elementary Flow	Ω Complex Potential ($z_0 = 0$)	$\phi(x, y)$	$\phi(r, \theta)$	$\psi(x, y)$	$\psi(r, \theta)$	Streamlines
1. Uniform flow	$Uze^{-i\alpha}$	$U(x \cos \alpha + y \sin \alpha)$	$Ur \cos(\theta - \alpha)$	$U(y \cos \alpha - x \sin \alpha)$	$Ur \sin(\theta - \alpha)$	
2. Source	$\frac{q}{2\pi} \ln z$	$\frac{q}{4\pi} \ln(x^2 + y^2)$	$\frac{q}{2\pi} \ln r$	$\frac{q}{2\pi} \tan^{-1}\left(\frac{y}{x}\right)$	$\frac{q}{2\pi} \theta$	
3. Vortex	$-\frac{i\Gamma}{2\pi} \ln z$	$\frac{\Gamma}{2\pi} \tan^{-1}\left(\frac{y}{x}\right)$	$\frac{\Gamma}{2\pi} \theta$	$-\frac{\Gamma}{4\pi} \ln(x^2 + y^2)$	$-\frac{\Gamma}{2\pi} \ln r$	
4. Doublet	$\frac{qa e^{i\alpha}}{\pi z}$	$\frac{qa \cos \alpha}{\pi(x^2 + y^2)}$	$\frac{qa \cos(\alpha - \theta)}{\pi r}$	$-\frac{qa \sin \alpha}{\pi(x^2 + y^2)}$	$\frac{qa \sin(\alpha - \theta)}{\pi r}$	