Vortex Velocity and Stream Function

$$V_\theta = \frac{\Gamma}{2\pi r}$$
$$V_\theta = -\frac{d\psi}{dr}$$
$$V_r = -\frac{1}{r}\frac{d\psi}{d\theta}$$

Stream function:

$$\psi = \frac{\Gamma}{2\pi}\ln(r)$$

Potential function:

$$\phi = \frac{\Gamma}{2\pi}\theta$$

Circulation:

$$\Gamma = \oint \mathbf{V}\cdot d\mathbf{s} = \iint_S (\boldsymbol{\nabla}\times\mathbf{v})\cdot\hat{n}\,dS$$

$$\Gamma = \iint (u\,dx + v\,dy) = \int V\cos(\phi)\,ds$$

Boyle's Law for Ideal Gases (Kinetic Theory)

$$pV = \frac{1}{3}T - \frac{1}{6}\rho\iiint (u^2+v^2+w^2)(x\,dy\,dz + y\,dz\,dx + z\,dx\,dy)$$

Newton's Potential around the Sun

$$\Phi = -\frac{GM}{r} + \frac{1}{6}\Delta c^2 r^2$$

Vacuum Energy Density Estimate

$$\frac{1}{V}\int \frac{1}{2}\hbar\omega \approx \frac{\hbar}{2\pi^2 c^3}\int_0^{\omega_{\max}} \omega^3 d\omega = \frac{\hbar}{2\pi^2 c^3}\omega_{\max}^4$$

Cosmological constant:

$$\Lambda \approx \frac{G^2 m^6}{\hbar^4}$$

Triple Integral Volume Identity

$$\int_S (x\,dy\,dz + y\,dz\,dx + 2z\,dx\,dy) = \iiint (1+1+1)\,dx\,dy\,dz = 3\int_0^1 dx\int_0^1 dy\int_0^1 dz = \boxed{3}$$