

$$G(r, z, r', z', \theta - \theta') = \sum_{m=-\infty}^{\infty} G_m(r, z, r', z') e^{im(\theta - \theta')}$$

$$\iff G_m(r, z, r', z') = \frac{1}{2\pi} \int_{-\pi}^{\pi} G(r, z, r', z', \phi) e^{-im\phi} d\phi.$$