

Gravitational lensing of electromagnetic and gravitational waves

Tutorial-2

1.) Point mass lens: Derive the position, Jacobian, and magnification of the images for a point mass lens.

2.) Singular Isothermal Sphere: Derive the position, Jacobian, and magnification of the images for a lens mass distribution

$$\rho(r) = \frac{\sigma_v^2}{2\pi G r^2}$$

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where the constant σ_v is the velocity dispersion of the particles.

3.) Rotation of coordinate system: Rotate lens plane coordinates (x_1, x_2) by an angle θ and derive the transformation of the vector (γ_1, γ_2) .