5.12: Diffraction Pattern for Pentagonal Finite Point Scatterers

Establish mask geometry:

$$R = 2 \quad m = 1..A \quad \Theta_m = \frac{2\pi m}{A} \quad x_m = R\sin(\Theta_m) \quad y_m = R\cos(\Theta_m)$$

Fourier transform of position wave function (mask geometry) into the momentum representation:

$$\Phi(p_x,\ p_y) = \frac{1}{2\pi d\sqrt{A}}\left[\sum_{m=1}^{A}\left(\int_{x_m-\frac{d}{2}}^{x_m+\frac{d}{2}} exp(-ip_x x)dx \int_{y_m-\frac{d}{2}}^{y_m+\frac{d}{2}} exp(-ip_y y)dy\right)\right]$$

Display mask geometry and diffraction pattern: $A = 5 \quad d = .3$

$$N = 100 \quad \Delta p = 10 \quad j = 0..N \quad k = 0..N \quad px_j = -\Delta + \frac{2\Delta pj}{N} \quad py_k = -\Delta p + \frac{2\Delta pk}{N}$$

$$\text{Diffraction pattern}_{j,\,k} = (|\Phi(px_j,\ py_k)|)^2$$