

HW10 Solution

$$10.25 \quad q = 1.22 \frac{R\lambda}{2a} = 1.45 \times 10^5 m.$$

$$10.29 \quad a \sin \theta_m = m\lambda, \sin \theta_m \approx \frac{\Delta y}{d},$$
$$\Delta y_{min} = 0.46m.$$

$$10.33 \quad \Delta y_1 - \Delta y_2 = \Delta \lambda \cdot \frac{d}{a} = 6mm.$$

10.37 The path length difference inside the grating can be neglected, so the refractive index won't enter the equation.

$$10.52 \quad R_m \approx \sqrt{mr_0\lambda}, R_1 = 0.75mm.$$

10.53 The full first zone has a radius $q_1 = 1.22 \frac{R\lambda}{2a}$, so half the first zone corresponds to $q = 1.22 \frac{R\lambda}{2\sqrt{2}a}$. Eqn (10.55) becomes

$$I = \frac{I_0}{2R^2} \left[\frac{J_1(kaq/R)}{kaq/R} \right]^2 = \frac{I_0}{2R^2} \left[\frac{J_1(1.22\pi/\sqrt{2})}{1.22\pi/\sqrt{2}} \right]^2 \approx \frac{0.013I_0}{R^2}.$$