Problem Set 3
Physics 266 Second Semester, AY 2024-2025
10 points per number Due: 30 May 2025 (Friday)

1. **Diffraction grating** (Section 8.6, Born & Wolf). Plot the normalized intensity function *I(p)* of a reflection grating (size: 64 x 64 mm^2, groove spacing d = 0.64 micron = $2s$, Figure 8.19c) where: $0 \le p \le 4\lambda/s$ for λ = 0.400, 0.550 and 0.800 micron.

2. Plot *I(m)/I(m=0)* where m is the spectral order, $p = m\lambda/d$ and $0 \le p \le 4\lambda/s$. Generate plots for: λ = 0.400, 0.550 and 0.800 micron. Interpret your results.

3. Plot the resolution limit $\Delta\lambda$ as a function of λ at m = 1, 2 and 4 (Section 8.6.1, Equation 14) for $0.400 \le \lambda$ (micron) ≤ 1.1 (512 data points). How does the resolution improve with increasing m? Is there a corresponding trade-off?

4. **Prism**. Plot the resolution limit $\Delta\lambda$ versus λ for a similarly sized prism (Section 8.6.1, Equation 17) for $0.400 \le \lambda$ (micron) ≤ 1.1 (512 data points). The prism material is made of the refractive index assigned to you in Physics 265. Cite the possible advantages of using a prism rather than a grating.

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