1. Fresnel Double Mirror **(5 pts)**

Hecht, problem 9.20:

In the Fresnel double mirror, $\lambda_0 = 589$ nm, the distance of the screen from the two virtual sources (Fig. 9.12) is $s = 2$ m, $R = 1$ m, and the separation of fringes is $\Delta y = 0.5$ mm. Determine the inclination angle α between the mirrors.

2. Fizeau Fringes **(3 pts)**

Hecht, problem 9.34:

A piece of paper ($d = 76.18$ μm) separates two glass plates (*e.g.*, microscope slides) at one end while the plates touch at their other end. Determine the no. of fringes seen across the length of the two glass plates.

3. Index of Air **(4 pts)**

Hecht, problem 9.37:

How many fringe shifts will seen in a Michelson interferometer in monochromatic light ($\lambda_0 = 600$ nm) if a path length of $x = 10$ cm in one of the arms changes from air ($n_{air} = 1.00029$) to vacuum?

4. Anti-Reflective Coating I **(5 pts)**

Hecht, problem 9.43:

For normal incidence and $n_0 \approx 1$, show that the reflected irradiance of a film-coated interface with a film thickness $d = \lambda_0/4$ is always smaller than the reflected irradiance of the bare interface, as long as $n_0 < n_f < n_1$.

5. Anti-Reflective Coating II **(3 pts)**

Hecht, problem 9.47:

A camera lens ($n_{gl} = 1.55$) is coated with a cryolite film ($n_{cr} = 1.30$) as an antireflective coating. What is the optimal film thickness for incident green light ($\lambda_0 = 500$ nm)?

6. Fabry-Perot Interferometer (Bonus Problem) **(5 pts)**

Hecht, problem 9.40:

The mirrors in a Fabry-Perot interferometer have a refletion coefficient $r = 0.8944$. Determine (a) the coefficient of finesse F, (b) the half-width γ, (c) the finesse Φ and (d) the contrast factor, $C = \left(I_t/I_i\right)_{\max} \big/ \left(I_t/I_i\right)_{\min}$.