1. Higher order dispersion in a grating compressor

Consider a laser with a central wavelength of 800 nm. The bandwidth limited pulse has been stretched with a group dispersion delay of $D_2 = 1.81 \cdot 10^6 \text{ fs}^2$ and a third order dispersion of $3.2563 \cdot 10^6 \text{ fs}^3$. During propagation, the pulse additionally acquires GDD while traversing 10 cm of BK7. Considering a grating compressor with a line density of 1480 mm$^{-1}$ and an angle of 20.2 degree between both grating, which additional separation in the compressor is needed to compensate for the total GDD? Is the TOD also compensated for? If not, how can you solve this problem?

2. Misaligned grating compressor

Consider the above grating compressor and calculate the incident angle on the first grating. The laser has a spectral bandwidth of $\Delta \lambda = 50 \text{ nm}$ (gaussian spectrum). Assuming that the laser is focused using an f/20 parabola, with an aperture $d_{FWHM} = 5 \text{ cm}$, how much does the pulse elongate in focus due to the angular chirp if the compressor is misaligned by an angle of 0.1 mrad?

3. What color?

Why is it generally harder to run blue lasers than red ones? *Hint: Look at the Einstein coefficients.*