Homework1
Answer the questions 1-3
Start working on the project.

ME297

SJSU Eradat

1) Disperion and Abbe number

A. What kind of Abbe V number offers large dispersion
B. What is the sign of the Abbe V number for a glass with
   a) negative dispersion
   b) Positive dispersion
   c) No dispersion over
C. Find 3 glasses from a catalogue (mention the source) with
   a) Negative dispersion
   b) Positive dispersion
   c) Minimum dispersion
D. What can we say about dispersion of a glass in IR range based on its Abbe V number?
E. Find the catalogue information for a low and high dispersion glass and explain meaning of the information listed for them.

2) Rules of thumb

- Decisions are made by efficiently applying "rules of thumb" to make quick approximations. Throughout your career, you should make sure to collect these and know how and when to use them (Jime Burge). As part of your homework assignments, **you should review the relevant notes and find at least 3 useful rules of thumb from the last week's lecture notes**. Report them in the following format.

Name for Rule	Small Angle Approximation
The Rule of Thumb	$\sin\theta \cong \theta$ (in radians)
When is this used?	This is used for small angles (< 0.2 radians or 11.5^0) Application of this approximation greatly simplifies analysis and calculation
Limitations	The percent error in the approximation is roughly $\theta^2/6$ x 100% so the approximation is valid to < 1% for angles < 0.24 radians (14°) and is valid to 0.01% (100ppm) for angles < 1.4. (you find this by calculating $(\sin\theta - \theta)*100$ for a range of angles and arguing when if you use it is a situation what kind of error you are signing up for)

3) A camera focused between 3 meters & infinity

- A point and shoot camera company claims their digital camera can take sharp images of the objects located between 1m and infinity. The pixel size is 3X3 (micron^2), Lens aperture is 5mm in diameter , lens focal length is 10mm.
  a) Evaluate validity of the claim numerically for green light (550nm). Draw diagrams if necessary.
  b) What happens when you consider red (750 nm) and blue (450nm) light? For which wavelength the focus is better?
  c) What if the the diameter of the lens is 2.5 mm and f is 5 mm
  d) What if the diameter is 10 mm and the focal length is 10mm.
  e) Organize your findings as a function of f# which is f/D and wavelength in the form of an easy rule to remember.