1. Most of the binoculers in the SFSU Observatory are so-called “7×50s”, meaning that they magnify by a factor or 7 and have lenses with a diameter of 50 mm.

   (i) How much more light do these binoculers collect than a dark-adapted eye with a pupil diameter of 0.8 cm?

   (ii) If you are in a very light-polluted place and can only detect stars down to magnitude 2 with your unaided eye, what are the faintest magnitude stars you might expect to be able to detect with these binoculers?

2. Imagine you could somehow put an eyepiece on one of the Keck telescopes in Hawaii (diameter 10 m) and look through it with your eye.

   (i) How much more light would you get into your eye with the telescope than without it? (By what factor is the Light Gathering Power of the Keck greater than your eye?)

   (ii) From the top of Mauna Kea, where Keck is located, the sky is very dark. With the unaided eye, you can see down to magnitude 6 or so (similar to the faintest stars Hipparcos could see way in ancient Greece). What magnitude stars would you expect to be able to see with the aid of the Keck telescope?
3. Suppose you want to observe the binary star system known as gamma Andromedae with the one of the SFSU telescopes on a fixed mount (the ones we use in class). Consider the specifications of the telescopes in the SFSU Observatory, as given on the accompanying handout. Suppose you also have at your disposal eyepieces with the following focal lengths:

40 mm, 32 mm, 25 mm, 15 mm, 10 mm

(a) Suppose you want to make the apparent separation of the two stars as large as possible when viewed through your setup. Which fixed-mount SFSU telescope and which eyepiece should you choose?

(b) With the setup in (a), what magnification would you get?

(c) If you were observing γ And with the setup in (a), how far apart would the two stars appear to your eye? Look up the angular separation of this binary on the internet and give the url reference where you found the information.

(d) When you are first trying to locate the binary, which eyepiece should you use and why?