**(2/10, 30 minutes) Say you have a system that has a photometric zeropoint of 23.5 in the bandpass where you plan to make observations, and you are observing at a site with 1 arcsec seeing, a background of 21 magnitudes per square arcsec with a detector with readout noise corresponding to 5 electrons/pixel, and a plate scale of 0.5 arcsec/pixel.**

1. **How long do you need to expose to get a S/N of 100 for a 15th magnitude object?**

   The signal-to-noise ratio ($S/N$) is given by

   $$\frac{S}{N} = \frac{S}{\sqrt{S + AB + N_{pix}\sigma_{rn}^2}} = \frac{S}{\sqrt{S + AB'Tt + N_{pix}\sigma_{rn}^2}}$$

2. **How long do you need to expose to get a S/N of 50 for a 22nd magnitude object?**