Reading: Aristotle, On the Heavens, Book II.

**Problem 1:** Suppose the Earth is a perfect sphere with radius $R$. Suppose that an observer is standing on a beach and looking towards the horizon.

(a) Draw a diagram that indicates how far a person of height $h$ can see into the horizon.

(b) Use your diagram in part (a) to compute the distance an observer can see given $h$ and $R$.

(c) If $R = 6371\text{km}$ and $h = 2\text{m}$, use your answer in (b) to compute the distance an observer can see into the horizon. Compare this to if an observer is standing on a mountain so that $h = 2000\text{m}$.

**Problem 2 (Diurnal Parallax):** Let the radius of the Earth be $R$.

(a) Draw a diagram to indicate how to use parallax and the celestial sphere’s rotation to measure the distance of a celestial object.

(b) Give a formula for the distance of the object to an observer based on two observations of the observer. The formula should only depend on $R$, the angle between the observations and the observed parallax angle.

(c) If the observer can only look with the naked eye and so can only detect differences of up to $1^\circ$, what is the farthest object for which the observer can tell its distance using this method?