ASTR1050
Fall 2025

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Due Date: 12 September, 11:59 PM

1. True or False: Angular size is independent of distance.

2. The Earth has radius 6.071×10^6 m and is 1.50×10^{11} m away from the Sun. Find the angular size (in degrees) of the Earth, when viewed from Mars when Mars and the Earth are closest to each other in their orbits. Mars orbits the Sun at a distance of 2.28×10^{11} m.

3. You are on an orbital space mission around Earth when you notice an astronaut some distance away from you. The astronaut appears to be $30'$ (*i.e.* arcminutes) in size, from head to toe. If you assume the astronaut is 1.8 m tall, how far away is the astronaut from you?

4. You are star gazing from Wyoming ($105\,^\circ$ W, $41\,^\circ$ N) when you observe a star crossing the meridian. If the star is $37\,^\circ$ above the southern horizon, what is the star's declination?

5. Suppose you go on a trip to an undisclosed island. Using your knowledge of Astronomy, you realize that you can calculate the latitude of your location. If the date is **21 June**, and the Sun is $63\,^\circ$ above the northern horizon at noon, what is your latitude?

6. Find the angular speed of the moon in the sky (viewed from Earth) in degrees per day.

7. A satellite is launched into orbit around the Earth. Find the required altitude above the Earth's surface for the satellite if the desired orbital period is 1 Earth day, or 24 hours. The Moon's orbital period is 27.3 days with a semi-major axis of 3.84×10^8 m and the Earth's radius is 6.071×10^6 m.

8. Find the orbital period of a satellite orbiting Earth if it orbits at a distance of 7.70×10^8 m. The Moon's orbital period is 27.3 days with a semi-major axis of 3.84×10^8 m.

9. Find the orbital speed of Mars using Kepler's Laws. Mars orbits at a distance of 1.523 AU from the Sun.

10. Planet X is a proposed Neptune-sized planet in the outer solar system. Calculate the period of this planet if it is hypothesized to orbit at a distance of 752 AU from the Sun (This planet is hypothesized to be in a highly eccentric orbit, and would spend the vast majority of its orbit much further than 752 AU from the Sun).