

## ASTR 121: Homework 3

Due Thursday, September 17th, 2009

*For problems of a mathematical nature, show all work for full credit (including multiple choice responses).*

- (10 pts)** Why does the Moon appear red during a total lunar eclipse?
  - The surface of the Moon is red and the light from the Sun that reaches the Moon reflects that red color.
  - Martians have taken over the Moon and are flashing red lights at us but can only be seen when the Sun's light is not being reflected.
  - The small amount of light from the Sun that does reach the moon travels through the Earth's atmosphere, which scatters blue light, leaving only reddened light to be reflected.
  - The Moon does not appear red, it appears as it always does except darker.
- (15 pts)** *Chapter 3, prob. 26:* What is the phase of the Moon if it rises at **(a)** midnight; **(b)** sunrise; **(c)** halfway between sunset and midnight; **(d)** halfway between noon and sunset? Explain your answers.
- (15 pts)** Why doesn't a lunar eclipse occur at every full moon and a solar eclipse at every new moon?
- (15 pts)** Hopefully you've heard of the Pink Floyd album, but what the dark side of the Moon really refers to its synchronous rotation. This means that the same face of the Moon always points towards Earth, **NOT** that only one side of the Moon is illuminated by the Sun. Pretend you are camping on the surface of the Moon for a month. How does the Earth appear to move in the lunar sky? Explain.
- (15 pts)** Your friend Cindy tends to embellish her stories. She was recently on a trip to South Africa, and she claims to have seen a total solar eclipse. Tonight (September 9th, 2009), the lunar phase is waning gibbous. If Cindy was on her trip on June 20th, could she have seen a total solar eclipse? If not, in what phase was the Moon? (**Hint:** *the synodic month is 29.53 days.*)
- (15 pts)** *Chapter 3, prob. 36:* If the Moon revolved about the Earth in the same orbit but in the opposite direction, would the synodic month be longer or shorter than the sidereal month? Explain your reasoning.

7. (**15 pts**) You observe the waning gibbous moon at the meridian at your local time (1:00am). Your friend James Bond, who is a quarter of the way around the world ( $90^\circ$  longitude) has a local time of 7:00pm. (**a**) What phase of the Moon does James Bond see and (**b**) where and which cardinal direction (N, S, E, W) does it appear in his sky?