

You may use two sheets of notes. You may not use books or additional notes.

Name	
PID	
Signature	
1	/ 9
2	/ 13
3	/ 9
Total	/ 31

1. Short answers

- a. (3 pts.) Astronomers measured the distance to Mars using the method of parallax and inferred the size of Jupiter's orbit. Why was it unnecessary to measure the distance to Jupiter directly?
- b. (3 pts.) Annie Jump Cannon (1863-1941) lived in an exciting period in astronomy. Name three discoveries in astronomy made in her lifetime.
- c. Adams discovered that Sirius B is $1/100^{\text{th}}$ the size of Sirius A and is thus a new type of star. (1 pt.) What kind of star is Sirius B? (2 pts.) What was Adams' key measurement?

2. Figure 1 is the Hertzsprung-Russell diagram of the star cluster M15.

- a. (2 pts.) What is the absolute magnitude of the hottest main-sequence stars?
- b. (3 pts.) Why are there no hotter main-sequence stars?
- c. Stars with a color $B-V=0.6$ span a range of 5 magnitudes. (2 pts.) What property of the stars accounts for this observation? (3 pts.) What is the range of this property?
- d. (3 pts.) Find the distance to M15.

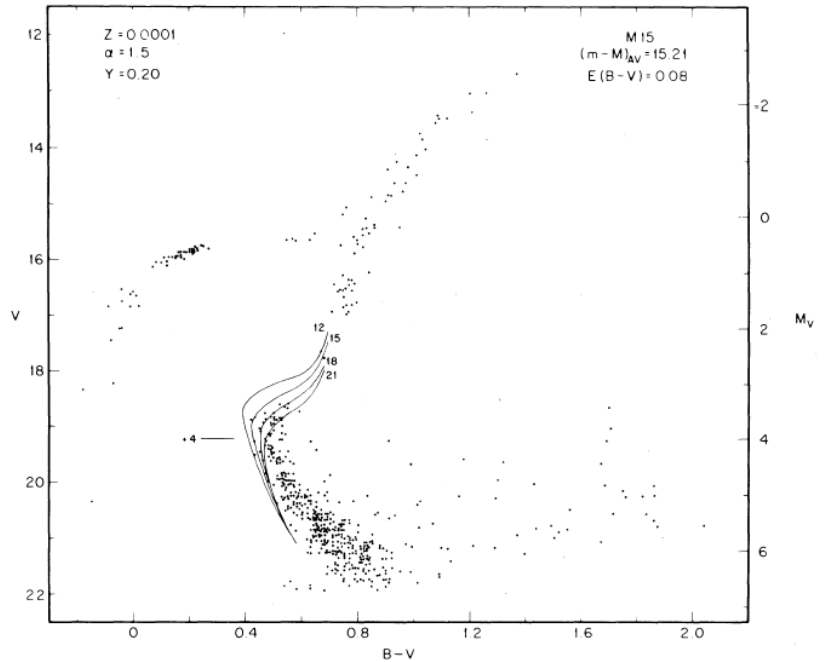


Figure 1 Hertzsprung-Russell diagram of the star cluster M15. B-V is a measure of color. The vertical scale on the left is apparent magnitude, and the scale on the right is absolute magnitude.

3. Observations of the parallactic shift of a star are shown in Figure 2. (Assume the star is in the plane of the Earth's orbit and the Earth's axis is not tilted.)

- a. (3 pts.) Find the distance (in parsec) to the star.
- b. (1 pt.) What is the right ascension of the star? (2 pts.) Explain your reasoning.
- c. (3 pts.) Why do astronomers find the parallactic shift by comparing the positions of the star and a very distant star? Why do they not measure the coordinates of the star directly?

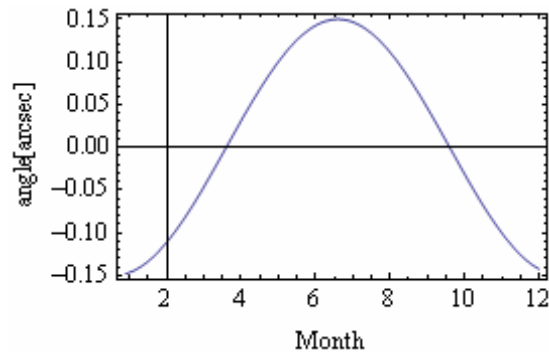


Figure 2 Parallactic shift vs month of the year. For example, month 10 is the beginning of October. A shift to the east is positive.