ASTR 1404 Stars, Galaxies, and Cosmology

Problem Set 2 Solutions

June 6, 2016

Problem 1.

A visual binary has a parallax of 0.1 arcsec, a separation of 4 arcsec, and an orbital period of 100 years. Star B is 3 arcsec from the Center of Mass (CM) and Star A is 1 arcsec from the CM.

1 (a).

What is the distance to the binary?

1 (b).

What is the physical distance between the two stars?

1 (c).

What is the total mass of the binary?

1 (d).

What are the masses of each of the two stars?

Problem 2.

The bright star of αCentauri is actually a binary. The parallax of αCen is 0.752 arcsec, the orbital period is 80.1 years, and the separation between αCenA and αCenB is 17.6 arcsec.

2 (a).

What is the distance to αCen?

2 (b).

What is the physical separation between the stars?

2 (c).

What is the total mass?

2 (d).

αCenA is 7.9 arcsec from the CM and αCenB is 9.7 arcsec from the CM. What are the masses of each star?

Problem 3.

The bright star Procyon is a binary. The parallax of Procyon is 0.29 arcsec, the separation between star A and star B is 4.5 arcsec, and the orbital period is 40.6 years.

3 (a).

What is the distance to Procyon?

3 (b).

What is the physical separation between the stars?

3 (c).

What is the total mass of the binary?

3 (d).

What are the masses of each of the two stars? $\theta_A = 1.2\,\mathrm{arcsec}$ and $\theta_B = 3.3\,\mathrm{arcsec}$.