

Introduction to Astrophysics

Fall 2021

Homework 3

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Exercise 1

The two-dimensional Morgan–Keenan spectral classification scheme enables astronomers to locate a star's position on the Hertzsprung–Russell diagram based entirely on the appearance of its spectrum. Once the star's absolute magnitude, M , has been read from the vertical axis of the H–R diagram, the distance to the star can be calculated from its apparent magnitude, m , via Eq. (3.5), $d = \frac{10(m-M+5)}{5}$, where d is in units of parsecs.

The blue-white star Fomalhaut (“the fish’s mouth” in Arabic) is in the southern constellation of Pisces Austrinus. Fomalhaut has an apparent visual magnitude of $V = 1.19$. Use the H–R diagram in Fig. 1 to determine the distance to this star.

Exercise 2

From the H-R diagram figure 5 on the 9-15-2021 class make a table with all the distinctive characteristics of the stars Rigel, Deneb, Regulus, Sirius, Altair, Sirius B, Proxima Centauri and Betelgeuse. Describe their spectral class, temperature, distinctive features and any other information you could also gather from astronomical databases (ie <http://simbad.u-strasbg.fr/simbad/>). Discuss differences, similitudes, stellar mass, radius, distance, etc..

The following exercises are only for the graduate students who are taking the PHYS 6381 class.

Exercise 3

Derive equations (114)-(117) from equations (6), (7), (101) and (107), using (112) and (113). Show your calculations.

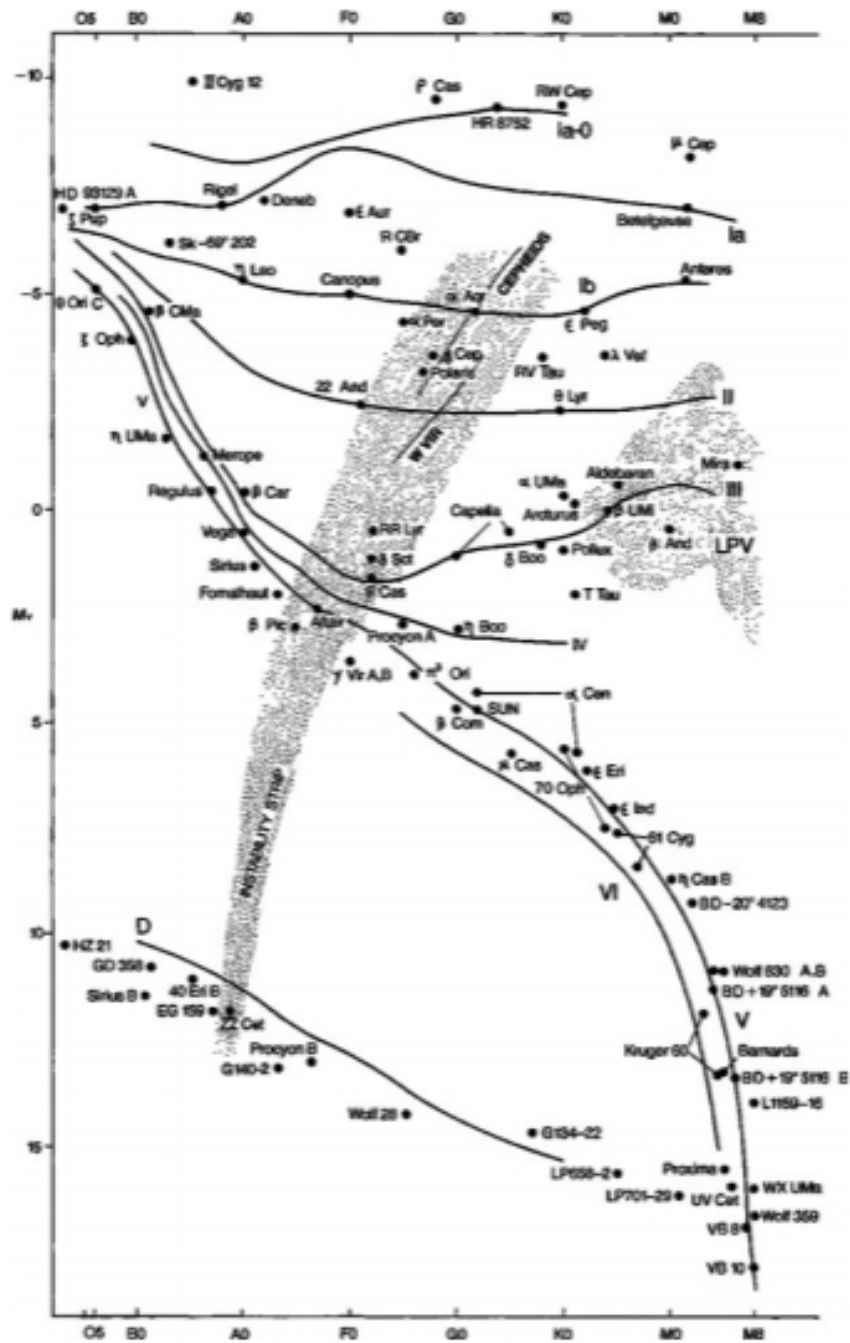


Figure 1: Luminosity classes on the H-R diagram. (Figure from Kaler, Stars and Stellar Spectra, © Cambridge University Press 1989. Reprinted in Carroll, Bradley W.; Ostlie, Dale A.. An Introduction to Modern Astrophysics