PHYS-181 ASTRONOMY
Homework #6

DUE: Week 8 Class @ 7:00pm

NO LATE ASSIGNMENTS WILL BE ACCEPTED

Assignments must be turned in at the lecture, or submitted (in a commonly used format) via e-mail to both of the following addresses:

scheidly@newton.physics.drexel.edu
scheidly@drexel.edu
1) What are the spectral type, temperature, absolute magnitude and luminosity of Star a?

Spectral type: 
Temperature: 
Absolute magnitude: 
Luminosity: 

2) Which two pairs of labeled stars in the diagram have the same temperature? 

3) Do stars of the same temperature have the same spectral type? Use a pair of stars from your answer to question 2 to support your answer.
4) Which two pairs of labeled stars have the same luminosity?

5) Do stars with the same luminosity have the same absolute magnitude? Use a pair of stars from your answer to question 4 to support your answer.

6) If two stars have the same absolute magnitude, do they necessarily have the same temperature? Use a pair of stars from the H-R diagram on the previous page to support your answer.

7) Stars of the same spectral type have the same (circle one):

   absolute magnitude  temperature  luminosity

8) Stars of the same absolute magnitude have the same (circle one):

   spectral type  temperature  luminosity

9) For each of the following star descriptions, state whether the star would be a red giant, white dwarf, or main sequence star, and provide the letter(s) of a star from the H-R diagram that fits each description.

   a) very bright (high luminosity) and very hot (high temperature)

   b) very dim and cool

   c) very dim and very hot

   d) very bright and cool
Part I: Magnitudes and Star Distances

Below is a table of four stars and their apparent and absolute magnitudes. Use this table to answer the following questions.

<table>
<thead>
<tr>
<th>Star</th>
<th>Apparent Magnitude</th>
<th>Absolute Magnitude</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>5</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

1) Which object appears brighter from Earth: Star C, Star D, or neither? Explain your reasoning.

2) Which object is more luminous: Star C, Star D, or neither? Explain your reasoning.

3) Star B has an apparent magnitude of 0, which tells us how bright it appears from Earth at its true location. Star B has an absolute magnitude of 2, which tells us how bright it would appear if it were at a distance of 10 parsecs (about 33 light-years).

Where would Star B appear brighter, in its true location or if it were at a distance of 10 parsecs? Explain your reasoning.

4) Is Star B closer than 10 pc, farther than 10 pc or exactly 10 pc away? Record your answer in the table above and explain your reasoning.

5) How far away is Star D? Record your answer in the table above.

6) Is Star C closer than 10 pc, farther than 10 pc or exactly 10 pc away? Record your answer in the table above.

7) Complete the remaining blank in the distance column of the above table and check your answers with another group.
Below is a table giving both the apparent magnitude and spectral type for five main sequence stars. For each star, do the following:

8) Using the above H-R diagram, estimate the absolute magnitude for each star and write your answer in the absolute magnitude column of the table below.

9) Complete the distance column in the table below by classifying each star as being closer, slightly farther, or much farther than 10 parsecs away. This procedure, called spectroscopic parallax, provides astronomers with another strategy to measure the distance to stars.

<table>
<thead>
<tr>
<th>Star</th>
<th>Apparent Magnitude</th>
<th>Spectral Type</th>
<th>Absolute Magnitude</th>
<th>Distance Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rigel Kentaurus</td>
<td>0.0</td>
<td>G2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vega</td>
<td>0.04</td>
<td>A0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rigel B</td>
<td>6.6</td>
<td>B9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Achernar</td>
<td>0.5</td>
<td>B3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tau Scoopius</td>
<td>2.8</td>
<td>B0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: By completing this table, you have estimated the distance to a star by comparing the apparent and absolute magnitudes without using a formula. The exact distance can be calculated using the formula $d = 10^{\frac{m-M}{5}}$ pc, where $m$ is the apparent magnitude and $M$ is the absolute magnitude. It is not necessary to perform any calculations to complete the table above.