# ASTRONOMY 020
Problem Set #19
Due: March 12, 2004

1. A pulsating star has mean radius $R_0$, maximum radial displacement $\Delta R$, and pulsation period $P$.
   (a) Assuming sinusoidal oscillations, write down an analytical formula for $R(t)$, the instantaneous radius $R$ as a function of time $t$.
   (b) Use the answer to (a) to calculate the maximum radial velocity (in km/s) of the star if $R_0 = 58.3\,R_\odot$, $\Delta R/R_0 = 0.025$, and $P = 3$ days.

2. A Cepheid variable in an external galaxy is observed to pulsate with a period of ten days. It's mean apparent visual magnitude is +18.0. What is the distance to the galaxy if this is a Pop I Cepheid? (Use Figure 18-3 in the text. Also note that we ignore the effect of interstellar absorption.)

3. Write a paragraph about the Crab Nebula.

Practice problems:

1. Zeilik & Gregory, Chapter 18, problem 5.
   Answers: $d = 260$ pc, $M = -8.9$.

2. Zeilik & Gregory, Chapter 18, problem 6.
   Answers: $L_{\max}/L_{\min} = 1.6 \times 10^9$ for $M_{\min} = +5$. $L_{\max}/L_{\min} = 1.0 \times 10^8$ for $M_{\min} = +2$.