Name: .....

ASTRONOMY 1102 - Section 1

Instructor: Juhan Frank

Spring 1999

Homework # 5 due Fri. Mar. 5

Cluster H-R Diagrams: Distances and Ages

1) The distance to a cluster can be estimated by constructing an "observed" H-R diagram in which the *apparent* magnitudes of cluster stars are plotted against the color index or the spectral type. Comparing this diagram with a "calibrated" or "theoretical" H-R diagram in which the *absolute* magnitude is plotted against the color index or the spectral type, one can determine by how much one must shift vertically to make the main sequences lie on top of one another. This shift equals the *distance modulus* m - M.
What are the approximate distances in parsecs to the following clusters:

Cluster	Type	m - M	Distance
M103	open	12	*$(1.585)^{12}$x10pc = $(1.585)^{10}$x$(1.585)^{2}$x10pc=2.5 kpc*
Pleiades	open	6	*$(1.585)^{6}$x10pc = $(1.585)^{5}$x$(1.585)^{1}$x10pc= 158 pc*
Hyades	open	3	*$(1.585)^{3}$x10pc = 40 pc*
M53	globular	17	*$(1.585)^{17}$x10pc = $(1.585)^{15}$x$(1.585)^{2}$x10pc=25 kpc*

HINT: Recall m - M = 0 at 10 pc, and a *factor* of 1.585 further away for every magnitude.

2) The table below gives the main-sequence life-time of stars of selected spectral types. Use that information and the H-R diagrams shown schematically on Fig. 25-19 to estimate the ages of the following clusters:,

B0V	10^7 yr
B5V	10^8 yr
A0V	10^9 yr
F0V	$3x10^9$ yr
G0V	$9x10^9$ yr
G2V	10^{10} yr
K0V	$3x10^{10}$ yr

Cluster Name	MS Turnoff	Age
h and chi Persei	*B0V*	*10^7 yr*
M 67	*F5-G0*	*6-$9x10^9$ yr*
Cluster 752	*A5-F0*	*2-$3x10^9$ yr*
NGC 188	*G0*	*$9x10^9$ yr*
Coma	*A0*	*10^9 yr*