

### Homework # 3, due Mar 1

1. Show that the main sequence of dwarf (low-mass) stars for Population II stars (low-metallicity) lies below that of Population I stars (high-metallicity).
2. Show that the total electrostatic energy of a uniformly positively charged sphere, of total charge  $Z$  and radius  $R$ , at the center of a larger sphere of radius  $R_c$  and charge  $-Z$ , such that the total configuration has no net charge, is

$$E_{coul} = \frac{3 Z^2 e^2}{5 R} \left[ 1 - \frac{3 R}{2 R_c} + \frac{1}{2} \left( \frac{R}{R_c} \right)^3 \right].$$

The filling factor  $u$ , the fractional volume occupied by the smaller sphere, is  $u = (R/R_c)^3$ .