Your name: _____

Arvind Borde

AST 10: Homework 4b

1. Look through your notes and fill in columns B and C in the table below with the densities and the units we used (kg/m^3, g/cm^3, etc.) for each object. In each case, use powers of 10, not "billions," etc.

Densities

Column A **Object**	Column B **Density**	Column C **Units**	Column D **Densities in gm/cm^3**
Water			
The Earth			
Lead			
A white dwarf			
A neutron star			

2. $1\,\text{kg/m}^3$ converts to $10^{-3}\,\text{gm/cm}^3$. Why?

3. Whether or not you can explain the previous conversion, use it to fill in Column D in the table above. You'll now have all the densities in the same units, and you can see how they compare.

4. Remember that density $= \dfrac{M}{V}$ where M is the mass and V the volume.
What is volume in terms of M and density?

5. Using $M_\odot \approx 2 \times 10^{33}\,\text{gm}$ and the previous result, what are the volumes of a one solar-mass (a) white dwarf, and (b) neutron star?

6. As you may remember, the formula for volume is $V = \dfrac{4}{3}\pi r^3$. What is r in terms of V?

7. Use the answers of the previous two questions to get the radii of a one solar mass (a) white dwarf, and (b) neutron star. The answer will be in cm. Convert it to km (one km is $100{,}000$ cm).

8. Here are the dimensions of some common things:
Diameter of Earth: $1.3 \times 10^4\,\text{km}$. Length of Manhattan: $21.6\,\text{km}$.
Which of these is closest to the *diameter* of a white dwarf radius? Which to a neutron star?