

**Astronomy 110: Survey of Astronomy**  
**Homework #4**  
**(Due June 22<sup>nd</sup>, 2005)**

1. The size of a Black Hole's Event Horizon, the "surface" from within which nothing can escape (not even light) is defined by the Schwarzschild radius,  $R_s$ :

$$R_s = 2GM / c^2$$

- a. What is the Schwarzschild radius (in meters) of a ten solar mass ( $M = 10M_{\text{sun}}$ ) Black Hole? (*Please show your work*)
- b. If you wanted to become a Black Hole, how small would you need to make your body? In other words, what's your Schwarzschild radius? Let's assume you weigh 65 kilograms. (*Please show your work*)

Here are the constants you'll need:

$$G = 6.67 \times 10^{-11} \text{ m}^3/(\text{kg s}^2)$$

$$c = 3 \times 10^8 \text{ m/s}$$

$$M_{\text{sun}} = 2.0 \times 10^{30} \text{ kg}$$

2. Approximately how many times has our solar system orbited the center of our Galaxy since the Sun and planets were formed approximately 4.6 billion years ago? (*Hint: Remember from Chapter 1 that our Sun completes one orbit around the center of the galaxy every 230 million years.*) (*Please show your work*)
3. Explain why Galactic spiral arms are believed to be regions of recent and ongoing star formation.