

# PHYS 1040: Elementary Astronomy

## Homework #3, Spring 2008

*“The most incomprehensible thing about the universe is that it is comprehensible.”*  
~Albert Einstein

**1:** Describe what is meant by *escape velocity*.

**2:** It might be fun to hold a Great Debate at Weber State, reminiscent of the Shapley-Curtis Debate. Instead of arguing about the nature of galaxies, we will debate the distance to the quasars. As our most knowledgeable orator on astronomy, you have been chosen to defend the notion that quasars are distant objects. Why do we believe that quasars are very distant, and not close to the Earth?

**3:** Quasars were first observed in radio light. If the quasar 3C 273 was first observed at frequency of  $f = 1.5 \times 10^9$  Hz<sup>1</sup>, what was the wavelength  $\lambda$  of this radio light?

**4:** You are captain of the starship *USS Intrepid*. While on patrol you discover a nearby black hole. Your science officer, Mr. Block, apparently has not had as much astronomy as you have, and suggests you fly closer to the black hole to take a look. Describe to your science officer the idea of tidal forces, and why you should be worried about them as you fly close to a black hole.

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<sup>1</sup>Astronomers will usually call this “1.5 Gigahertz”.

**5:** Henrietta Swan Leavitt was one of the first people to understand how to measure great distances in astronomy, using variable stars known as *Cepheids*. Explain the *period luminosity relationship* that Swan discovered, and how is it used in astronomy.

**6:** Your younger brother comes to you one day with a conundrum. “A silly astronomy professor from Weber State came to class today and told us that if I were close to the star Polaris, I shouldn’t look directly at it or it might burn my eyeballs out! I don’t understand – I look at Polaris every night and my eyeballs are just fine!” Explain the difference between *absolute brightness* and *apparent brightness* to your sibling. Why is it important to know the absolute brightness of objects in astronomy?