Astronomy 141 – Life in the Universe
Autumn Quarter 2008 – Prof. Gaudi
Homework #1

Due Monday, October 6 in class

Instructions: Answer the following four questions by circling the correct answer. Each question is worth the number of points given in parentheses (out of a total of 100). I may award partial credit if you show your work.

No late homework will be accepted.

Question 1 (40 points total)

Part 1 (20 points). One reason that the ancient Greeks didn't believe the heliocentric model is that it predicted that nearby stars should move relative to more distant stars due to the changing perspective arising from the motion of the Earth around the Sun. In other words, stars should exhibit annual *parallax*. Since they didn't observe these parallax motions, they reasoned the Earth must be stationary. Given that we now know that the Earth does indeed orbit the Sun, how far away must the nearest star be in order that the ancient Greek scholars failed to detect its parallax? *(Remember that the ancient Greeks did not have telescopes, so all of their observations were done with the naked eye.)*

   a) 1/1800 parsec
   b) 1/30 parsec
   c) 2 parsec
   d) 20 parsecs
   e) 200 parsecs

Part 2 (10 points). How far from the Sun is the nearest star?

a) about 4.5×10^6 AU
b) about 100 AU
c) about 8.2×10^4 AU
d) about 1000 AU
e) about 2.7×10^5 AU

Part 3 (10 points). How large is its annual parallax?

a) about 100 arcseconds
b) about 0.39 arcseconds
c) about 0.77 arcseconds
d) about 1.99×10^{-2} arcseconds
e) about 7.7 arcseconds

Question 2 (20 points)

How do you express the numbers 535.25 and 0.000663 in scientific notation?

a) 5.3525×10^2; 6.63×10^{-4}
b) 5.3525×10^5; 6.63×10^{-4}
c) 5.3525×10^{-2}; 6.63×10^4
d) 5.3525×10^1; 6.63×10^{-5}
e) 5.3525×10^3; 6.63×10^{-6}

Question 3 (20 points)

A new planet is found in the outer solar system that has a distance from the Sun of 100 AU. Astronomers decide to call this planet Ernie. If you visited Ernie what would be the apparent brightness of the Sun relative to its apparent brightness as seen from the Earth?

a) A thousand times fainter
b) Ten thousand times fainter
c) It would be just as bright
d) A hundred times fainter
e) A billion times fainter

Question 4 (20 points)

During one of your archaeological expeditions in Egypt, you find what appears to be a well-preserved mummy, who you decide to name Bert. By analyzing Bert's wraps, you discover that only 1/4 of the amount of original Carbon-14 in the cloth remains. How old is Bert? *(Assume the half-life of carbon-14 is 5,700 years.)*

a) 5,700 years old
b) 2850 years old
c) 11,400 years old
d) 1425 years old
e) 22,800 years old