Introductory Astronomy

Homework 19: Some Star Basics Not to be handed in. Homework solutions are posted already.

1. "Let's play *Jeopardy*! For $100, the answer is: The angular motion of stars on the sky as seen against the background of more distant stars due to the Earth's motion around the Sun."

   What is _____, Alex?

   a) the Doppler shift b) planetary parallax c) stellar parallax d) stellar paradox e) stellar motion

2. The straightforward surveyor's way of measuring the distance to a star is to use:

   a) stellar parallax with the Earth-Sun distance as a baseline.
   b) stellar parallax with the Earth-Moon distance as a baseline.
   c) solar parallax with the Earth radius as a baseline.
   d) solar parallax with the Earth-Sun distance as a baseline.
   e) a tape measure.

3. If a star exhibits 0.5 arcseconds of stellar parallax using the Earth-Sun distance as a baseline (which is conventional), how far is the star in parsecs?

   a) 0.5 pc. b) 1 pc. c) 2 pc. d) 4 pc. e) 10 pc.

4. The closest star to Earth (not counting the Sun) is _____ at 1.30 pc (4.22 ly).

   a) Barnard's Star. b) Jeffery's Star. c) Sirius A. d) Alpha Centauri A. e) Proxima Centauri.

5. If all the stellar parallaxes (i.e., parallax angles measured during a half revolution of the Sun) were **INCREASING** with time, this would mean that the stars were all:

   a) getting smaller. b) moving away. c) getting dimmer. d) getting redder. e) moving closer.

6. A dim star is located at about 2 million astronomical units from Earth. Recall $1\,\mathrm{AU} = 1.496 \times 10^{11}\,\mathrm{m}$ and $1\,\mathrm{pc} = 3.09 \times 10^{16}\,\mathrm{m}$. Approximately, what is the distance to the star in parsecs?

   a) 1.5×10^{11} pc. b) 2×10^{6} pc. c) 3×10^{17} pc. d) 3 pc. e) 10 pc.

7. In galaxy collisions, direct star-star collisions in which star matter impacts star matter occur:

   a) very rarely because interstellar distances are very large compared to star sizes. b) with high frequency. c) never. d) never: such collisions are physically impossible. e) for all stars in the colliding galaxies.

8. The total power of a star (i.e., energy output per unit time) is called:

   a) brightness. b) rightness. c) lightness. d) luminosity. e) incandescence.

9. The light from astronomical bodies is often studied by observering their light flux in broad wavelength bands using colored filters. (The emission is usually reported in astronomical magnitudes, but one doesn't need to know that.) The study of emission in this way is called:

a) spectroscopy. b) optometry. c) trigonometry. d) photometry. e) geometry.

10. The brightest stars are of order _____ times more luminous than the Sun and the dimmest are of order _____ times the Sun's luminosity.

    a) 10^{-5}; 10^{6} b) 1/2; 2 c) infinite; zero d) 10^{6}; 10^{-5} e) 2; 1/2

11. The flux (energy per unit time per unit area) of light from a star as a function of distance from the star obeys a/an:

    a) inverse-cube law. b) reverse-cube law. c) gravity law. d) force law. e) inverse-square law.

12. "Let's play *Jeopardy*! For $100, the answer is: This law describing how the light flux from a star decreases with distance is proven from this general physical principle as applied to the steady state nature of a star and the surrounding space."

    What is _____, Alex?

    a) the principle of equivalence b) the cosmological principle c) the perfect cosmological principle d) the relativity postulate e) conservation of energy

13. If you knew the luminosity of a star, then it distance could be determined directly:

    a) from its luminosity alone.
    b) a measurement of its flux using the inverse-cube law.
    c) a measurement of its flux using the inverse-square law.
    d) a measurement of its flux using any inverse power formula.
    e) in no known way.

14. According to one standard reference, the solar luminosity $L_\odot = 3.86 \times 10^{26}\,\mathrm{W}$ and the solar constant (i.e., the solar flux at the mean distance of the Earth) $f = 1373\,\mathrm{W/m^2}$. Stellar luminosity L and flux f are related by the inverse-square law

$$f = \frac{L}{4\pi d^2} \ ,$$

    where d is the distance from the center of the star to the location where f is measured. Solve for d analytically and then find mean Earth-Sun distance.

    a) $d = \sqrt{L/(4\pi f)}$ and $d = 1.496{\times}10^{11}$ m. b) $d = \sqrt{L/f}$ and $d = 1.496{\times}10^{11}$ m. c) $d = \sqrt{L}$ and $d = 1.496 \times 10^{2}$ m. d) $d = \sqrt{L/(4\pi f)}$ and $d = 1.496 \times 10^{2}$ m. e) $d = \sqrt{1/f}$ and $d = 1.496 \times 10^{11}$ m.

15. "Let's play *Jeopardy*! For $100, the answer is: This metaphorical expression is the name for the collection of distance measurement techniques used to establish cosmic distances on all scales."

    What is _____, Alex?

    a) Gandalf distaff b) distance distaff c) distance adder d) distance viper e) distance ladder