Astronomy 305: Life in the Universe
Homework 10: Chapter 10

Total points: 60

1. (10 pts) [a] What is a habitable zone, and how is the idea useful?
   [b] Is a planet in the habitable zone necessarily habitable? Explain.

2. (10 pts) [a] What is a runaway greenhouse effect, and why did it occur on Venus but not on Earth? [b] What does this fact tell us about the inner boundary of the Sun's habitable zone?

3. (6 pts) How do we expect the habitable zones of brighter stars to compare to that of the Sun?

4. (10 pts) [a] Why is planetary size important to habitability? [b] What does the case of Mars tell us about the minimum size? [c] Can we draw any conclusions about size from the case of Venus? Explain.

5. (10 pts) [a] Why does the Sun gradually brighten, and how does this brightening affect the location of the habitable zone over time?
   [b] What do we mean by a continuously habitable zone?

6. (2 pts) The habitable zone refers to
   (a) the regions of a planet where good weather allows life to exist;
   (b) the range of distances from a star where a planet's surface temperature is always above the freezing point of water;
   (c) the range of distances from a star within which water could exist in liquid form on a suitably sized planet.

7. (2 pts) Venus' atmosphere has much more carbon dioxide than Earth's because
   (a) Venus was born in a region of the solar system where more carbon dioxide gas was present;
   (b) Venus lacks oceans in which carbon dioxide can be dissolved;
   (c) Venus has volcanoes that outgas much more carbon dioxide than those on Earth.

8. (2 pts) What is the likely reason for Venus' lack of liquid water in any form?
   (a) The planet accreted little water during its birth.
   (b) The water is locked away in the crust.
   (c) The water was in the atmosphere, where molecules were broken apart by ultraviolet light from the Sun.

9. (2 pts) If Earth were to be moved to Venus' orbit, it would probably
   (a) stay bout the same temperature, thanks to the small amount of carbon dioxide in Earth's atmosphere;
   (b) become a tropical paradise;
   (c) suffer a runaway greenhouse effect and likely become even hotter than Venus is today.

10. (2 pts) The inner boundary of the Sun's habitable zone today is
    (a) inside the orbit of Venus;
    (b) between Venus and Earth;
    (c) outside the orbit of Earth.

11. (2 pts) As the Sun ages, the habitable zone will
    (a) move outward and grow wider;
    (b) move outward but get narrower;
    (c) stay about the same as it is now.

12. (2 pts) Global warming means that
    (a) Earth's average temperature is increasing;
    (b) every place on Earth is getting warmer;
    (c) Earth will soon have a greenhouse effect.