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Name (Last, first)

## Homework 7: Planet Temperatures

Due 10.20 am on 18<sup>th</sup> March 2005

In this homework we will study how the temperatures of the nine planets (Mercury through Pluto, ignoring all moons) vary with distance from the Sun.

1. The table overleaf lists the surface temperatures of the planets in degrees Celsius. Use these data to calculate the average temperature of each planet in degrees Kelvin (see Appendix 2 if you've forgotten how to do this). Then use your textbook or your notes to look up each planet's average distance from the Sun in Astronomical Units, and add these numbers to the table.
2. Using your table, plot each planet with a cross symbol (×) on the grid that is supplied. Note that the scales on the graph are logarithmic; this is a common technique used by scientists for data that are unevenly spaced.
3. A simple theory of solar heating predicts that the temperature (in Kelvins) of a planet will depend on its distance from the Sun (in AU) according to the law:

$$Temperature = \frac{300}{\sqrt{Distance}}$$

Calculate the theoretical temperature for at least four different distances and plot these values with a dot symbol (.) on your graph. The distances 0.1, 1, 10 and 100 AU are recommended.

Draw a straight line (if possible) through the four dots. The line represents the theoretical temperature of a planet.

4. Which planet agrees *least* well with the simple theory?
5. What temperature would you predict for the fake planet "Deearth" if it was at a distance of 2 AU from the Sun?
6. Roughly how close could the Earth get to the Sun before the oceans started boiling?

<b>Planet</b>	Temperature in degrees Celsius	Average Temperature (K)	Average Distance from Sun (AU)
Mercury	-170 to + 430 C		
Venus	472 C		
Earth	-50 to +50 C		
Mars	-140 to +20 C		
Jupiter	-130 C		
Saturn	-180 C		
Uranus	-220 C		
Neptune	-216 C		
Pluto	-230 C		

