Name: _____

Date: _____

Section: _____

Astron 104 Laboratory #3
A Step Toward A More Complicated Universe: The Motion of Mars

This table contains Heliocentric Ecliptic longitudes of Earth and Mars at 20 day intervals, centered on opposition.

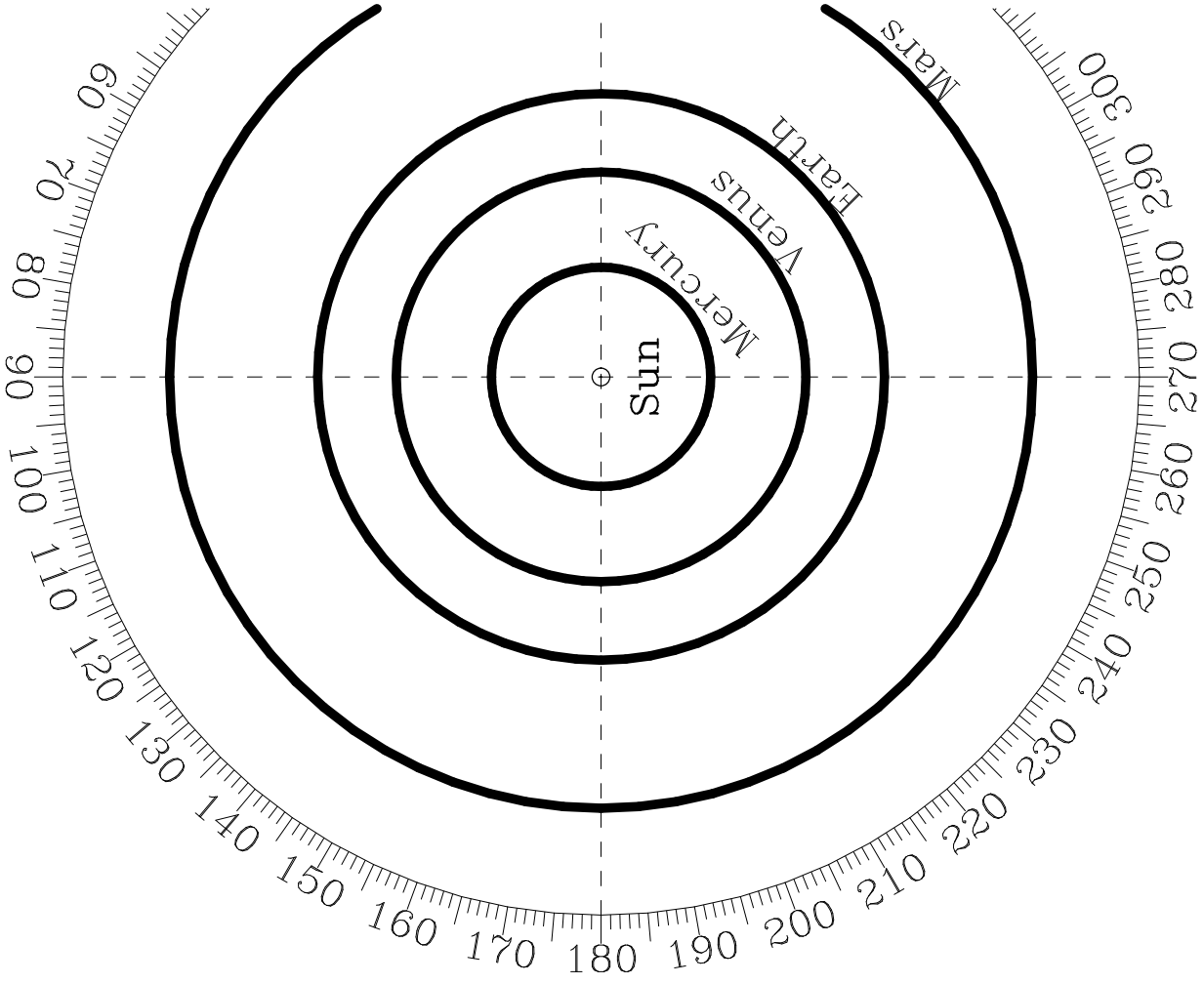
	Date	Earth Longitude	Mars Longitude
1	27 Dec., 1996	95.5°	141.5°
2	16 Jan., 1997	116.0°	150.5°
3	05 Feb., 1997	136.0°	159.0°
4	25 Feb., 1997	156.5°	168.0°
5	17 Mar., 1997	176.5°	176.5°
6	06 Apr., 1997	196.0°	185.5°
7	26 Apr., 1997	216.0°	194.5°
8	16 May, 1997	235.0°	204.0°
9	05 Jun., 1997	254.5°	213.0°

1. On the supplied planetary orbit chart, locate the orbits of Earth and Mars.
2. Locate the longitude for Earth's first position given on the longitude scale.
3. Place a ruler on the chart to line up with that position on the scale and the Sun's position at the center.
4. Mark the position on the Earth's orbit where that line intersects it, and label it "1."
5. Repeat steps 2–4 for the first position of Mars in its orbit, and also label it "1."
6. Draw a line between the two points labeled "1," and then extend that line out beyond the orbit of Mars to the horizontal line at the bottom of the page.
7. Put a dot at the end of the line you've just drawn, and also label it as "1."
8. Repeat the above steps for all the remaining data points, labeling them "2" through "9" and extending them all the same length beyond the orbit of Mars to the horizontal line at the bottom of the page.

9. Draw a dashed (or colored) line from numbered dot to dot in order. The resulting figure will approximate the path of Mars against the background stars during the 160 period covered by the data. What do you notice?

10. Why is this pattern observed?

11. Look at:
    http://astro.unl.edu/classaction/animations/renaissance/retrograde.html
    This should illustrate the same phenomenon as you just worked out. If not, check your work.


Mars
Earth
Venus
Mercury
Sun
60
70
80
90
100
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300