Corrections for Chapter 2

Page 32, right column, lines 9 and 10. Omit the parenthetical remark. The sphere of fixed stars rotates around its axis (see Figure 2.1) at a constant rate of one revolution per day. So every star moves at uniform speed in a circular path. The center of the circle lies on the axis, but in general this circle will not have the Earth at its center.

Page 33, left column. The statement of Proposition 2.1 should read: Consider a circle and any arc on it. Let A and B be the end points of the arc and let θ be the angle determined by the arc and the center of the circle. Let P be any point on the circle *outside* the arc. Then $\angle APB = \frac{\theta}{2}$. See Figure 2.4.

Page 33, left column, line 11 from the bottom: Replace "diagonal" by "diameter".

Page 34, right column, line 3. The statement of Proposition 2.2 should read: Take any arc on a circle and let A and B be its end points. Then $\angle APB$ is the same for all points on the circle *outside* the arc. See Figure 2.4.

Page 46, left column, end of second paragraph: Change "from the point of the observation;" to "determined by the position of X relative to the celestial equator;"

Page 49. Note 2 is not correct. The fact that the length of the year is slightly less than $365\frac{1}{4}$ days did cause a slippage in the calendar. While the calendar (the Julian calendar crafted at the time of Julius Caesar) had fixed March 25th to be the date of vernal equinox, by the sixteenth century vernal equinox was actually occuring around March 15th. However, this has no impact on the relative lengths of the seasons. The gradual change in the lengths of the seasons is explained as follows. It is a fact that the point on the orbit at which the Earth is farthest from the Sun moves along the orbit. The motion of this point - the aphelion position - is an extremely slow rotation caused by the gravitational forces of the Sun and Moon (and to a much lesser extent, the other planets). It takes twenty some thousand years for it to complete one revolution. As it rotates, the aphelion position moves through the arcs determined by the seasons (see *Figure 2.16*). It is also a fact (as already suggested by the concluding remarks of Section 2.5) that the Earth moves more slowly when it is farther from the Sun and more quickly when it is closer. The combination of these two factors means that the lengths of the four seasons change cyclically over time. Notice from the data provided, that two thousand years ago Spring was the longest season, with Summer second longest, and Autumn shortest. Since that time the length of Spring has decreased, Summer has become the longest season, and the length of Autumn has also increased. In a few thousand years, Autumn will be longest, and a few thousand years thereafter, this distinction will go to Winter.