

PHY 251 Spring 2008: homework problem set 1, due Wednesday, Feb. 6.

Problem 1: Work out the speed of the earth in its orbit from first principles. That is, start from equating gravitational force and centripetal force, and use the mass of the sun, and the mean earth-sun separation distance, to calculate the earth's speed in its orbital path.

Problem 2: Show that if one uses the Galilean relativity transformation of (Jan. 30 lecture, Eq. 3)

$$\begin{aligned}x_2 &= x_1 - vt_1 \\y_1 &= y_2 \\z_1 &= z_2 \\t_1 &= t_2\end{aligned}\tag{1}$$

and the relationships for expansion of light spheres (Sep. 7 lecture, Eqs. 1 and 2) of

$$x_1^2 + y_1^2 + z_1^2 - c^2t_1^2 = 0\tag{2}$$

$$x_2^2 + y_2^2 + z_2^2 - c^2t_2^2 = 0.\tag{3}$$

that you get a non-general and inconsistent-with-classical-physics result.

Serway problem 1.4

Serway problem 1.6

Serway problem 1.7

Serway problem 1.10

Serway problem 1.11

Serway problem 1.15

Serway problem 1.17

Serway problem 1.18

Serway problem 1.20

Serway problem 1.21