Honors Physics Circular Motion HW, part 2 (Homework)

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1.
A coordinate system (in meters) is constructed on the surface of a pool table, and three masses are placed on the coordinate system as follows: a 2.7 kg mass at the origin, a 2.0 kg mass at (0, 1.2 m), and a 4.2 kg mass at (3.7, 0 m). Find the resultant gravitational force exerted on the mass at the origin by the other two masses.
Magnitude:
Direction:

2.
Use the data of Table 7.3 to find the point between the Earth and the Sun at which an object can be placed so that the net gravitational force exerted on it by these two objects is zero.

Useful Planetary Data

Body	Mass (kg)	Mean Radius (m)	Period (s)	Distance from Sun (m)	T^2/r^3 (s^2/m^3)
Mercury	3.18×10^{23}	2.43×10^{6}	7.60×10^{6}	5.79×10^{10}	2.97×10^{-19}
Venus	4.88×10^{24}	6.06×10^{6}	1.94×10^{7}	1.08×10^{11}	2.99×10^{-19}
Earth	5.98×10^{24}	6.37×10^{6}	3.156×10^{7}	1.496×10^{11}	2.97×10^{-19}
Mars	6.42×10^{23}	3.37×10^{6}	5.94×10^{7}	2.28×10^{11}	2.98×10^{-19}
Jupiter	1.90×10^{27}	6.99×10^{7}	3.74×10^{8}	7.78×10^{11}	2.97×10^{-19}
Saturn	5.68×10^{26}	5.85×10^{7}	9.35×10^{8}	1.43×10^{12}	2.99×10^{-19}
Uranus	8.68×10^{25}	2.33×10^{7}	2.64×10^{9}	2.87×10^{12}	2.95×10^{-19}
Neptune	1.03×10^{26}	2.21×10^{7}	5.22×10^{9}	4.50×10^{12}	2.99×10^{-19}
Pluto	$\sim 1.4 \times 10^{22}$	$\sim 1.5 \times 10^{6}$	7.82×10^{9}	5.91×10^{12}	2.96×10^{-19}
Moon	7.36×10^{22}	1.74×10^{6}	-	-	-
Sun	1.991×10^{30}	6.96×10^{8}	-	-	-

Table 7.3

3.
A 588 kg satellite is in a circular orbit about the Earth at a height above the Earth equal to the Earth's mean radius. Find
(a) the satellite's orbital speed
(b) the period of its revolution, and
(c) the gravitational force acting on it.

4.

A satellite of mass 215 kg is launched from a site on the Earth's Equator into an orbit at 210 km above the surface of Earth.
(a) Assuming a circular orbit, what is the orbital period of this satellite?
(b) What is the satellite's speed in orbit?
(c) What is the minimum energy necessary to place this satellite in orbit, assuming no air friction?

5.
The Solar Maximum Mission Satellite was placed in a circular orbit about 130 mi above the Earth. Determine
(a) the orbital speed of the satellite and
(b) the time required for one complete revolution.

6.
(a) Find the acceleration of gravity at the surface of a neutron star of mass 1.5 solar masses and having a radius of 10.0 km.
(b) Find the weight of a 0.121 kg baseball on this star.
(c) Assume the equation $PE = mgh$ applies and calculate the energy that a 69.0 kg person would expend climbing a 1.00 cm tall mountain on this star.