

Ch3 HW2 (1425064)

Current Score: 0/26 Due: Mon Sep 20 2010 09:00 AM EDT

Question	1 2	Total
Points	0/18 0/8	0/26

Description

Gravitational force and the momentum principle

Instructions

Reading: Sec. 3.5

The first problem of this assignment is a multipart tutorial problem. You must get each part correct before you can move on to the next part.

1. 0/18 points

mi3 3.5.p.045.alt01.2.defective [1344334]

Predicting the motion of a planet

A star of mass 12×10^{30} kg is located at $\langle 8 \times 10^{12}, 3 \times 10^{12}, 0 \rangle$ m. A planet of mass 6×10^{24} kg is located at $\langle 6 \times 10^{12}, 7 \times 10^{12}, 0 \rangle$ m and is moving with a velocity of $\langle 0.5 \times 10^4, 1.3 \times 10^4, 0 \rangle$ m/s.

Your task is to predict the motion of the planet in two steps, each of duration 9.0×10^7 seconds. This is a multipart tutorial question. You must get each question correct before you can go on to the next question. In the first time interval the calculations are broken down into their details. In the second time interval you are asked to work more independently, using what you practiced in the first time interval.

To avoid buildup of small round-off differences, your own answers (after being judged correct within a small tolerance) are used as the basis for later calculations.

We will apply the Momentum Principle to the planet as the chosen system, and assume that the only significant interaction with the surroundings is with the stationary star. Orient the coordinate axes so that the motion is in the xy plane, with $z = 0$.

Part 1 of 14

What is the relative vector \vec{r} that points from the initial position of the star to the initial position of the planet?
 $\vec{r} = \langle \text{[]}, \text{[]}, 0 \rangle$ m

Submit

2. 0/8 points

mi3 3.5.p.044.nva [1544810]

(a) In outer space, far from other objects, block 1 of mass 35 kg is at position $\langle 8, 11, 0 \rangle$ m, and block 2 of mass 1200 kg is at position $\langle 17, 11, 0 \rangle$ m. What is the (vector) gravitational force acting on block 2 due to block 1? It helps to make a sketch of the situation.

$$\vec{F}_{\text{grav}} = \boxed{} \langle -3.47e-08, 0, 0 \rangle \text{ N}$$

(b) At 4.3 seconds after noon both blocks were at rest at the positions given above. At 4.4 seconds after noon, what is the (vector) momentum of block 2?

$$\vec{p}_2 = \boxed{} \langle -3.47e-09, 0, 0 \rangle \text{ kg} \cdot \text{m/s}$$

(c) At 4.4 seconds after noon, what is the (vector) momentum of block 1?

$$\vec{p}_1 = \boxed{} \langle 3.47e-09, 0, 0 \rangle \text{ kg} \cdot \text{m/s}$$

At 4.4 seconds after noon, which one of the following statements is true?

- Block 1 and block 2 have the same speed.
- Block 1 is moving faster than block 2.
- Block 2 is moving faster than block 1.

Assignment Details