Chapter 9 (Systems of Particles)

1- Three identical particles each of mass = 1 kg are placed in the xy plane. The position vector of the first is $\mathbf{r_1}$ = (1**i** + 4**j**) m and the second is $\mathbf{r_2}$ = (3**i** + 1**j**) m. What would be the position vector of the third particle if the center of mass of the three particles were at (3 m, 3 m)?

a. r_3 = (5i + 4j) m
b. r_3 = (3i - 1j) m
c. r_3 = (1i + 2j) m
d. r_3 = (2i - 6j) m
e. r_3 = (4i + 3j) m

2- An object at rest explodes into three pieces A, B and C. After the explosion, A has a mass of 2.0 kg and velocity (3.0*i) m/s, B has a mass of 3.0 kg and velocity (-1.0*j) m/s, and C has a mass of 1.0 kg and velocity v. Find the velocity v.

a. (-6*i + 3*j) m/s
b. (3*i + 6*j) m/s
c. (6*i - 3*j) m/s
d. (6*i + 3*j) m/s
e. (3*i - 6*j) m/s

3- Three particles are placed in the xy plane. A 4-gram particle is located at (3 , 4) m, and a 6-gram particle is located at (-2 , -6)m. Where must a 2-gram particle be placed so that the center of mass of this three-particle system is located at the origin ?

a. (0 , 10) m
b. (6 , -2) m
c. (5 , 10) m
d. (9 , 16) m
e. (-2 , 4) m

4- A 2.0-kg particle has a velocity of 4.0 m/s in the positive x direction and a 3.0-kg particle has a velocity of 5.0 m/s in the positive y direction. What is the speed of their center of mass?

a. 3.4 m/s
b. 3.8 m/s
c. 5.0 m/s
d. 4.4 m/s
e. 4.6 m/s

5- Two masses, 5 kg each, have velocities (in m/s): V1 = 12 i – 16 j and V2 = -20 I + 14 j. Determine the momentum of the center mass of the two masses (in kg m/s).

a. - 40 i - 10 j
b. 160 i –150 j
c. - 40 i + 10 j
d. 40 i – 10 j
e. - 160 i + 150 j

6- A uniform wire of mass M and length 2 m is bent to be all in one plane (see the figure). Find its center of mass with respect to point O.

a. (0 , 1/8)
b. (-1 , 1/8)
c. (1/2 , 1/3)
d. (1/8 , 3/8)
e. (1/3 , 1/3)