2. $X_{com} = ?$ $\quad X_{com} = \dfrac{m_1 x_1 + m_2 x_2 + m_3 x_3}{m_1 + m_2 + m_3}$

$$X_{com} = \frac{(3)(0) + (4)(2) + (8)(1)}{15}$$

$$= \frac{16}{15} = \boxed{1.07\,m}$$

b) $y_{com} = ?$ $\quad y_{com} = \dfrac{(3)(0) + (4)(1) + (8)(2)}{15}$

$$= \frac{20}{15} = \boxed{1.33\,m}$$

c) if m_3 gains mass (how does that happen?) then the com moves toward m_3

4. $r_{com} = ?$ (in comp. form)

$$X_{com} = \frac{m_1 x_1 + m_2 x_2 + m_3 x_3}{M}$$

$$= \frac{(0.014)(0) + (0.042)(0.11) + (0.014)(0.22)}{0.070}$$

$X_{com} = 0.11\ m$ (which I could have "guessed" at using symmetry!)

$$Y_{com} = \frac{(0.014)(-0.11) + (0.042)(0) + (0.014)(-0.11)}{0.070}$$

$$= -0.044\ m$$

$$\underline{r_{com} = 11\ cm\,\hat{i} - 4.4\ cm\,\hat{j}}$$

7. $\vec{r}_{com} = ?$

$x_{com} = 0$ (symmetry)

$$y_{com} = \frac{m_1 y_1 + m_2 y_2}{M} = \frac{(3m)(0) + (13.9m)(3.80\times10^{-11})}{16.9m}$$

$$y_{com} = 3.13\times10^{-11}\ m$$

6. a) $X_{com} = ?$ $X_{com} = \sum_{i=1}^{5} m_i x_i / M$

$$X_{com} = \frac{m(L) + m(L/2) + m(0) + m(L/2) + m(L/2)}{5m}$$

$$X_{com} = \frac{\frac{5L}{2}}{5} = \frac{L}{2} = \frac{40cm}{2} = 20cm = X_{com}$$

$Y_{com} = ?$ $= 20cm$ (by symmetry!)

c) $Z_{com} = ?$

$$Z_{com} = \frac{m(0) + 4\left[m\left(\frac{L}{2}\right)\right]}{5m} = \frac{2mL}{5m} = \frac{2}{5}L$$

$$= \frac{2}{5}(40_{cm}) = \boxed{16cm = Z_{com}}$$