

A few notes on problems in HW 3:

- 3.1) a) Be careful, when dealing with vectors, consider their direction!
b) State that momentum before shooting is zero (no velocity),
and by conservation of momentum: $P_i = P_f \Rightarrow P_f = 0$
- 3.5) The problem statement does not mention you can use momentum conservation. Momentum is not always conserved. Why can you make this assumption in this problem?

3.11) Keep in mind: $\vec{P} = \frac{d\vec{P}}{dt} = \vec{F}_{ext}$ $\Rightarrow d\vec{P} = \vec{F}_{ext} dt$
 $d\vec{P} \neq \vec{F}_{ext}$

3.13) Show steps of integral calculation.

3.15) Do not forget $\vec{R} = \frac{1}{M} \sum_i m_i \vec{r}_i$, \vec{R} and \vec{r}_i are vectors, treat them like vectors!

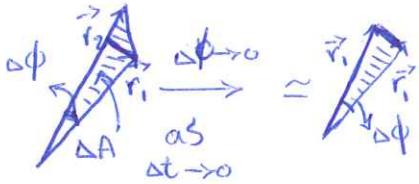
3.18) a) Consider the most general case in 3 dimensions.

- b) Treat vectors as vectors and not just lines without direction.
c) Pay attention to hints given!
d) Explain why CM is between m_1 and m_2 .

3.21) a) Mention $x_{cm} = 0$ by symmetry or show mathematically.

b) Show steps of integral calculation.

- 3.27) a) The orbit is not circular! In general $d\vec{r} = dr \hat{r} + rd\phi \hat{\varphi}$.
b) Explain why you can assume $\Delta\vec{r} \perp \vec{r}$!
c) Do not forget to deduce Kepler's law!



3.34) Explain why we can assume ω is constant during motion!

3.35) In parts (b) and (c) clearly explain why the torques due to other forces are zero.

Problem 1) a) A free particle doesn't have any potential energy.

b) $\vec{\nabla} U = -\vec{F}$