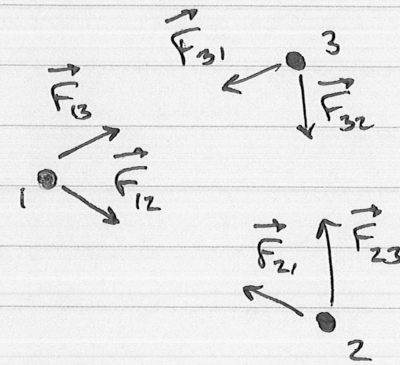
1.28



2^{nd} law...

particle 1: $\dot{\vec{p}}_1 = \vec{F}_{12} + \vec{F}_{13}$ (1)

particle 2: $\dot{\vec{p}}_2 = \vec{F}_{21} + \vec{F}_{23}$ (2)

particle 3: $\dot{\vec{p}}_3 = \vec{F}_{31} + \vec{F}_{32}$ (3)

define total momentum $\vec{p} = \vec{p}_1 + \vec{p}_2 + \vec{p}_3$

then
$$\begin{aligned}
\dot{\vec{p}} &= \dot{\vec{p}}_1 + \dot{\vec{p}}_2 + \dot{\vec{p}}_3 \\
&= \vec{F}_{12} + \vec{F}_{13} + \vec{F}_{21} + \vec{F}_{23} + \vec{F}_{31} + \vec{F}_{32} \quad \text{(from (1)-(3))} \\
&= \vec{F}_{12} + \vec{F}_{13} + (-\vec{F}_{12}) + \vec{F}_{23} + (-\vec{F}_{13}) + (-\vec{F}_{23}) \quad \text{(by 3}^{rd}\text{ law)} \\
&= (\vec{F}_{12} - \vec{F}_{12}) + (\vec{F}_{13} - \vec{F}_{13}) + (\vec{F}_{23} - \vec{F}_{23}) \\
&= \vec{0}
\end{aligned}$$

$\therefore$ $\vec{p}$ = const. (momentum is conserved) in the absence of external forces.