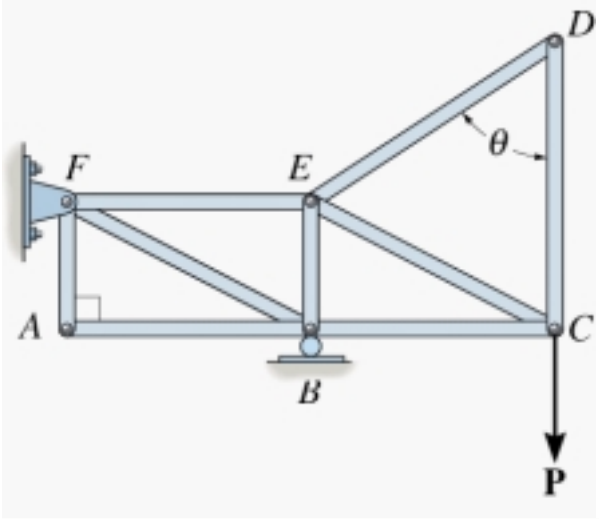
Simple trusses: Part 4

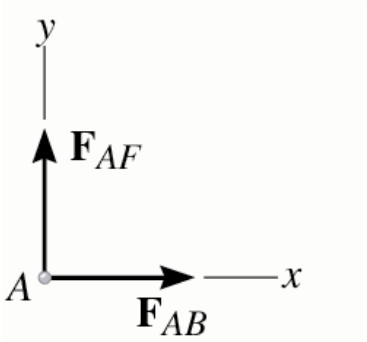
Analysis of trusses (Zero-force members):

Analysis is simplified if one can identify those members that support no loads. We call these zero-force members.

If two members form a truss joint and there is no external load or support reaction at that joint then those members are zero-force members.

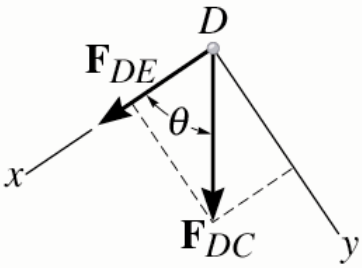
Joints D and A in the following figure are the joints with no external load or support reaction, so $F_{AF} = F_{AB} = F_{DE} = F_{DC} = 0$.





$\overset{+}{\rightarrow} \Sigma F_x = 0;\ F_{AB} = 0$

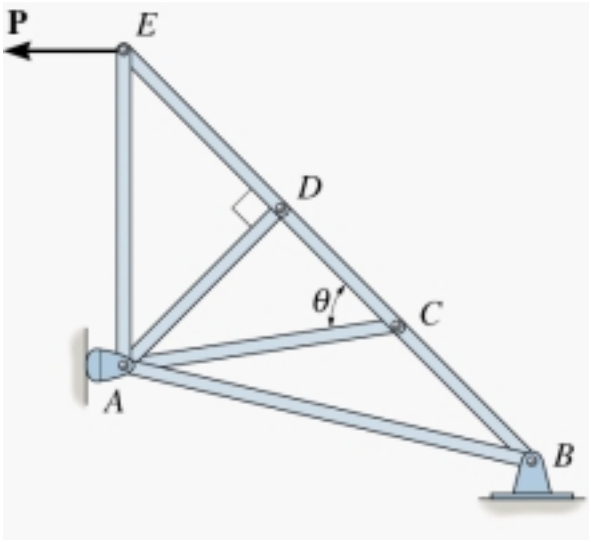
$+\uparrow \Sigma F_y = 0;\ F_{AF} = 0$

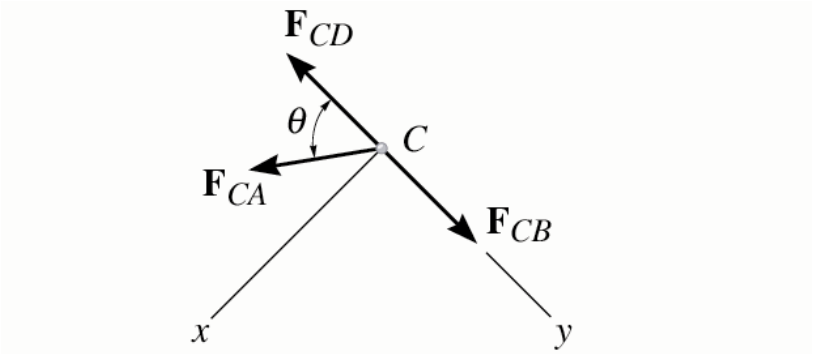


$+\searrow \Sigma F_y = 0;\ F_{DC} \sin\theta = 0;\ F_{DC} = 0 \text{ since } \sin\theta \neq 0$

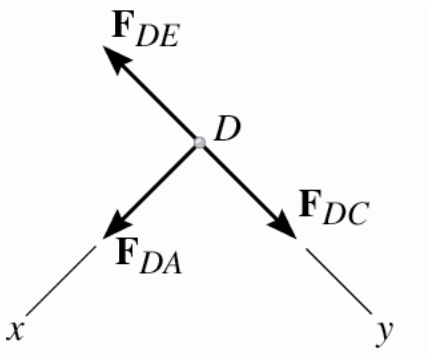
$+\swarrow \Sigma F_x = 0;\ F_{DE} + 0 = 0;\ F_{DE} = 0$

If three members form a truss joint and there is no external load or support reaction at that joint and two of those members are collinear then the third member is a zero-force member.
In the following figure, AC and AD are zero-force members.





$+\swarrow \Sigma F_x = 0;\ F_{CA}\sin\theta = 0;\quad F_{CA} = 0 \text{ since } \sin\theta \neq 0;$
$+\searrow \Sigma F_y = 0;\ F_{CB} = F_{CD}$



$+\swarrow \Sigma F_x = 0;\ F_{DA} = 0$
$+\searrow \Sigma F_y = 0;\ F_{DC} = F_{DE}$