

Estática

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Equilíbrio estático

- A ***Estática*** é a área da Física que estuda o equilíbrio de corpos rígidos.
- **Equilíbrio significa ausência de aceleração** e, portanto, velocidades de translação e rotação constantes. Nos problemas de equilíbrio *estático* é considerado também que as ***velocidades são nulas***.
- As condições de equilíbrio de um sistema estão determinadas pelas Leis de Newton da Mecânica:

somatória das forças externas nula: $\sum_i \vec{F}_i = 0$

somatória dos torques externos nula: $\sum_i \vec{r}_i \times \vec{F}_i = 0$

Diagrama Espacial, Corpo Livre e Triângulo de forças

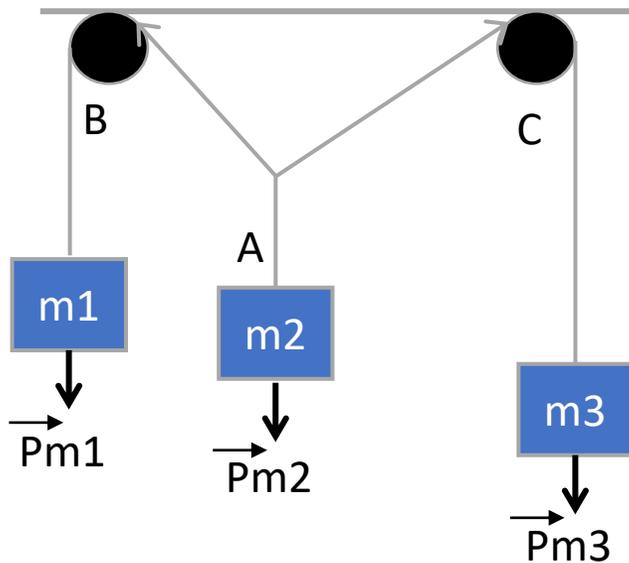


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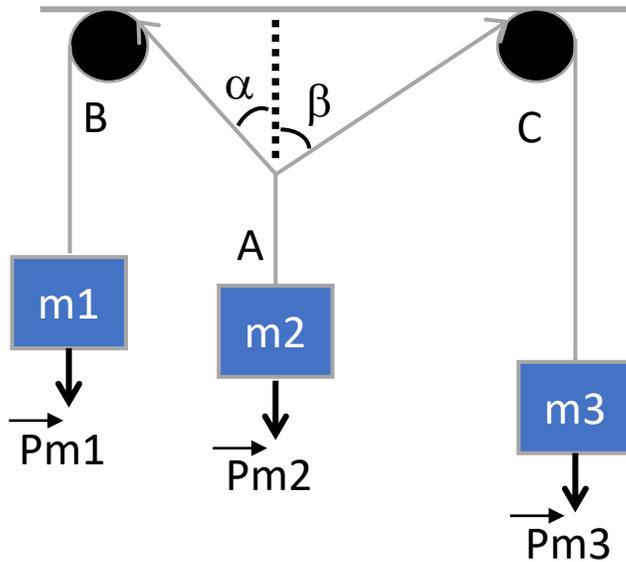


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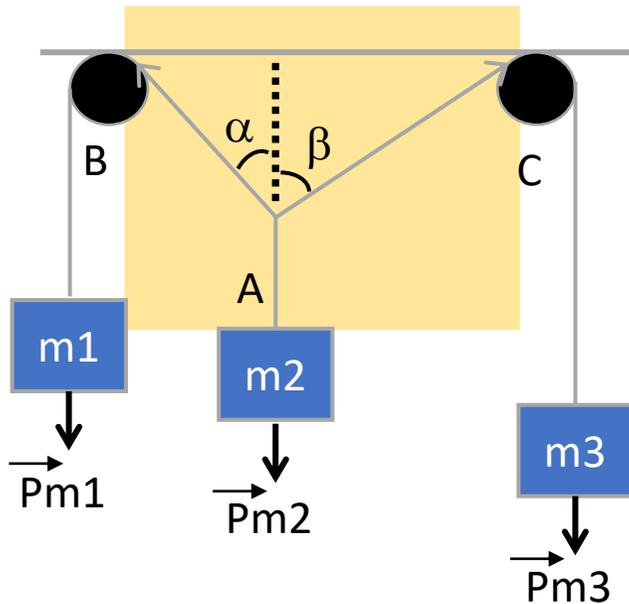


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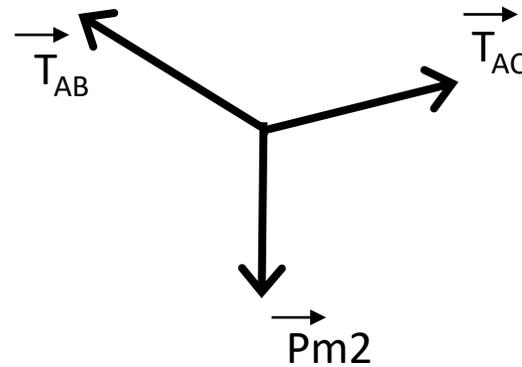
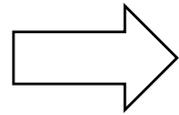


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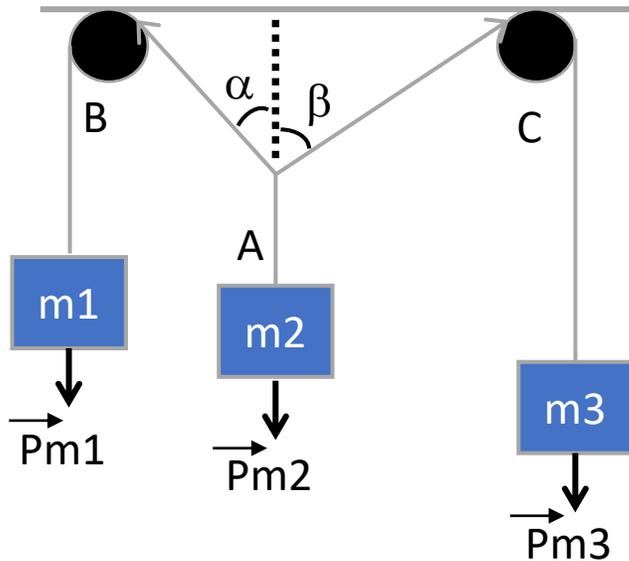


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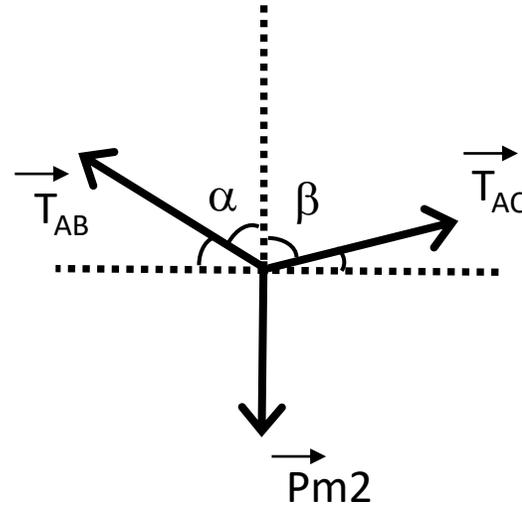
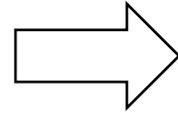


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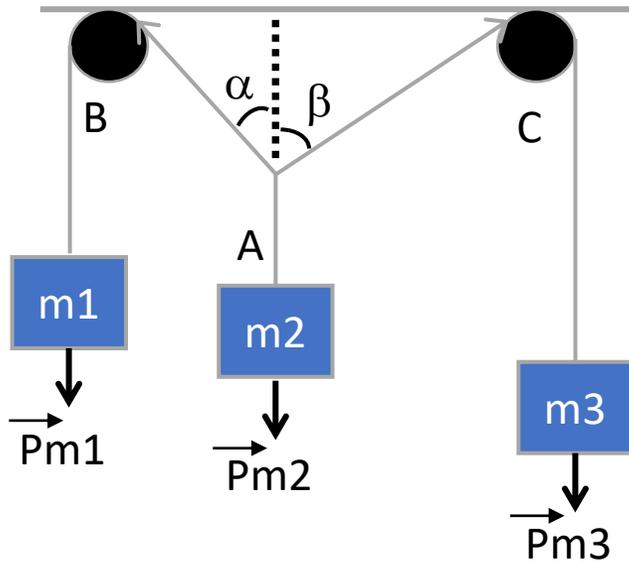


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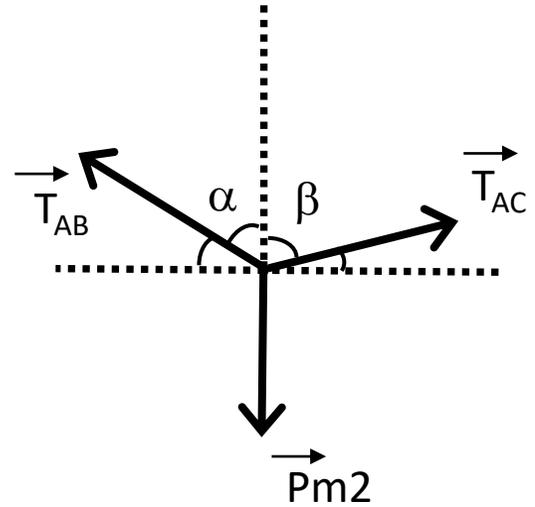
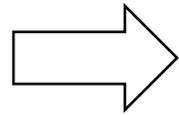
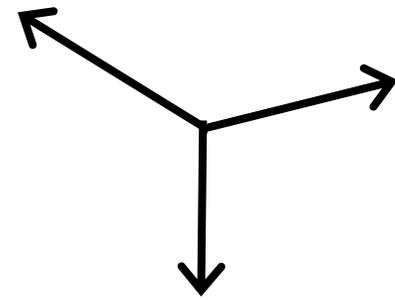
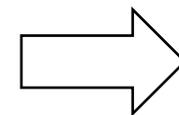


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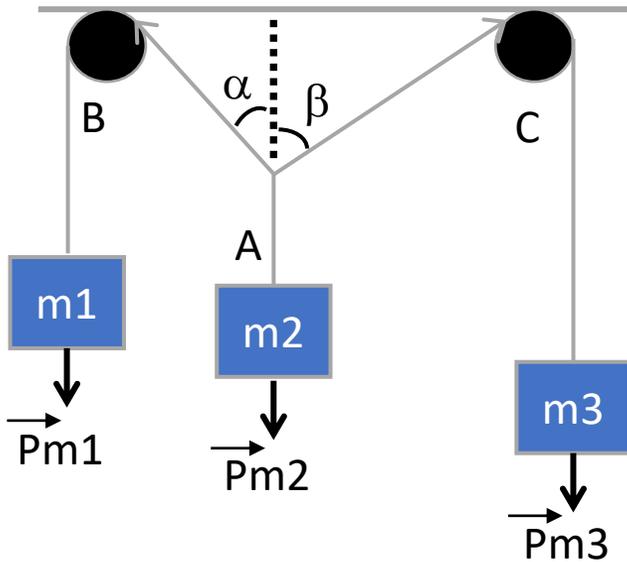


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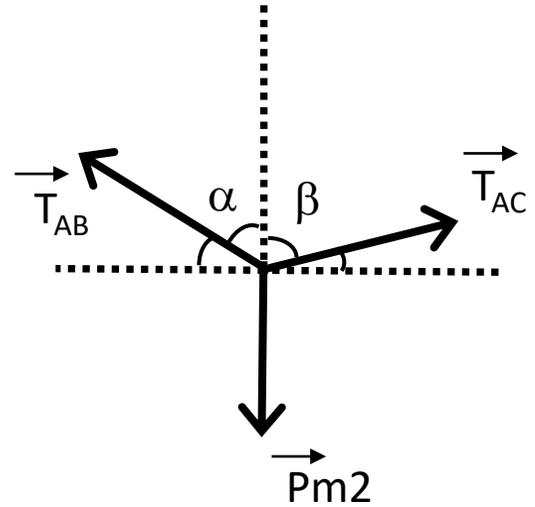
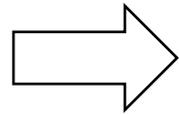
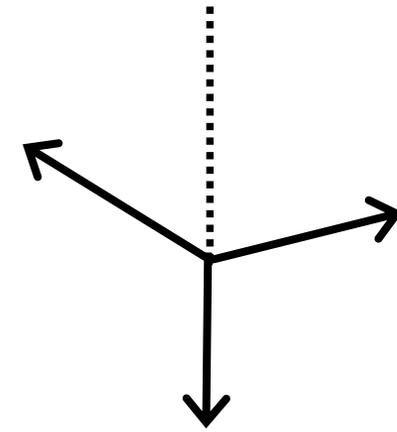
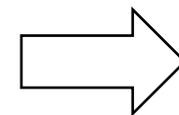


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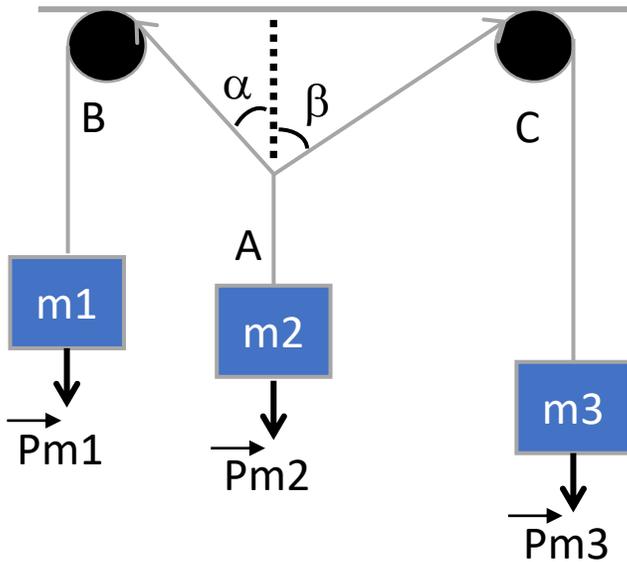


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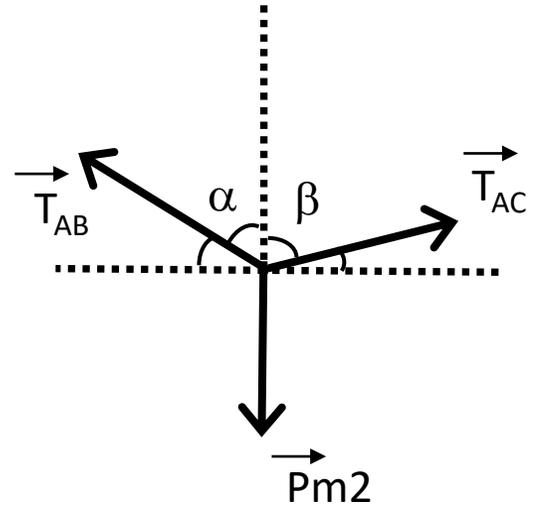
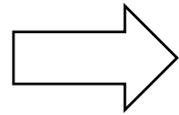
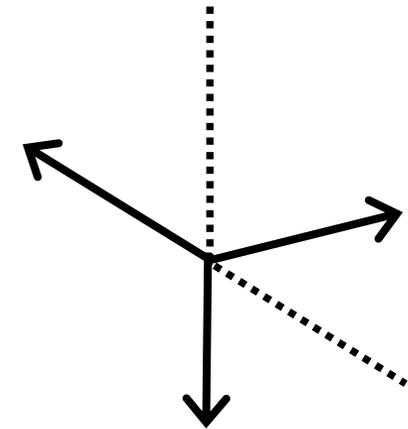
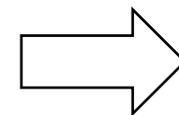


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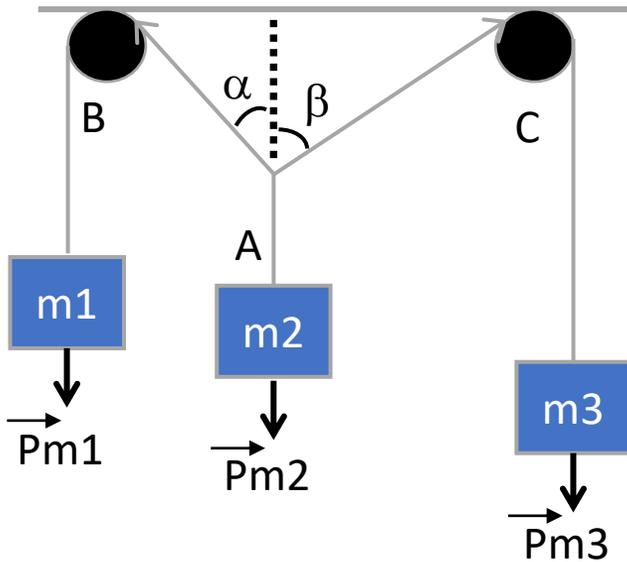


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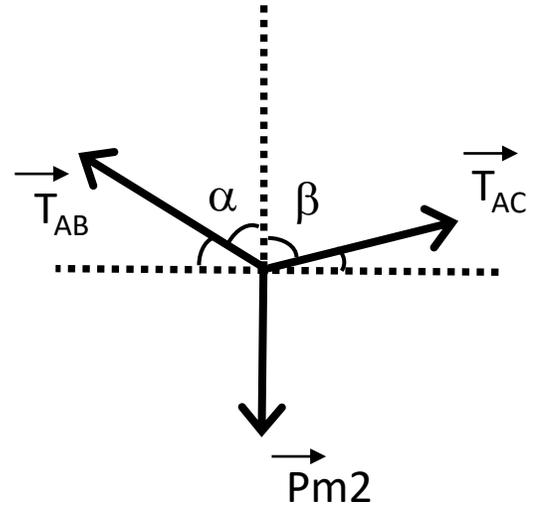
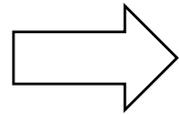
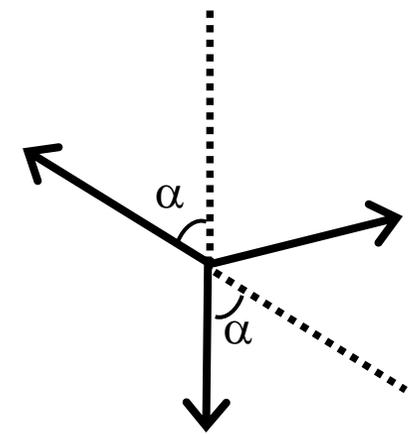
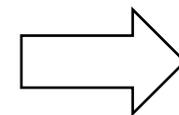


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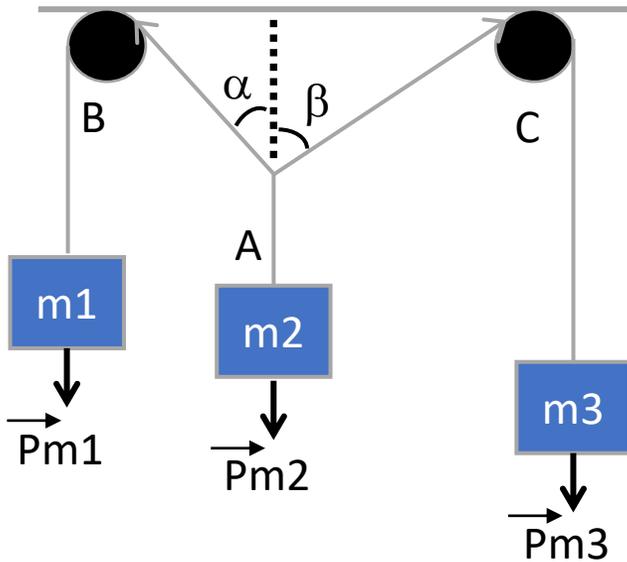


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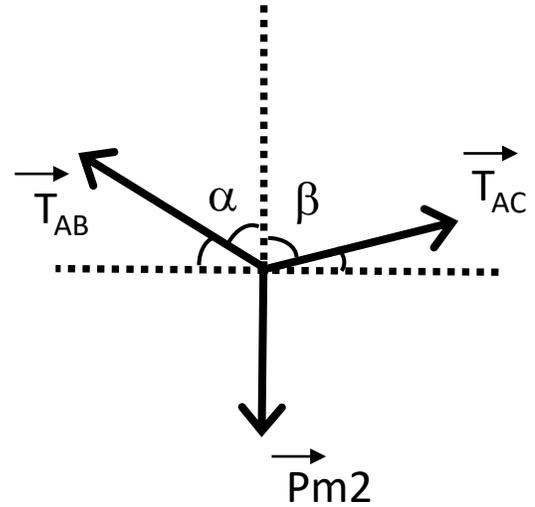
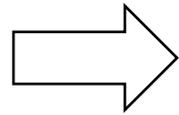
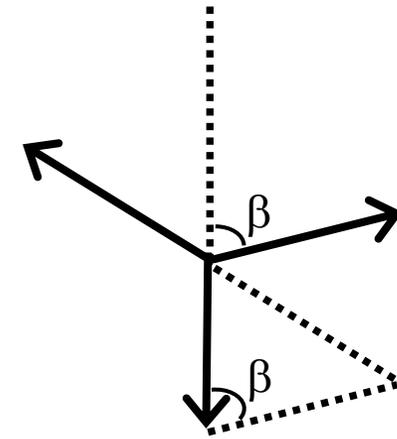
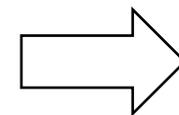


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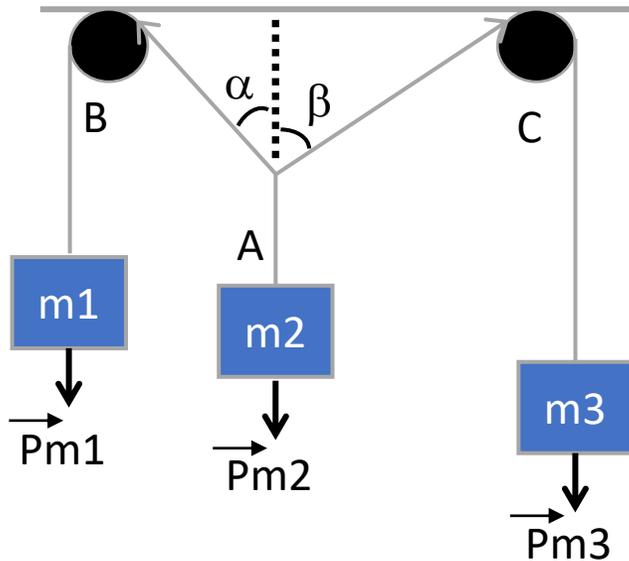


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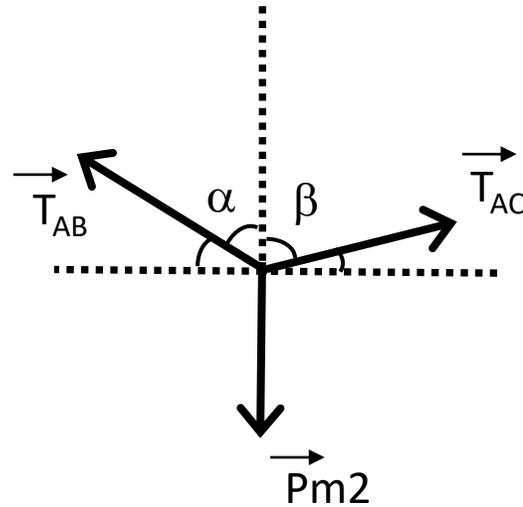
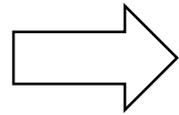
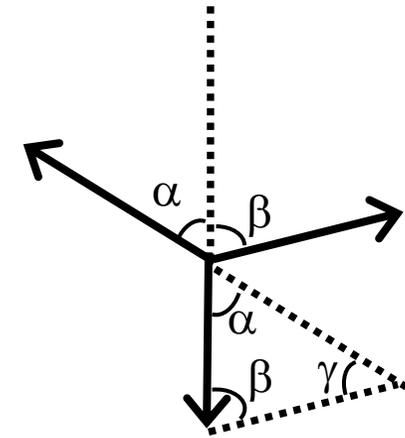
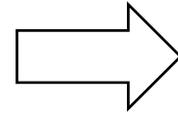


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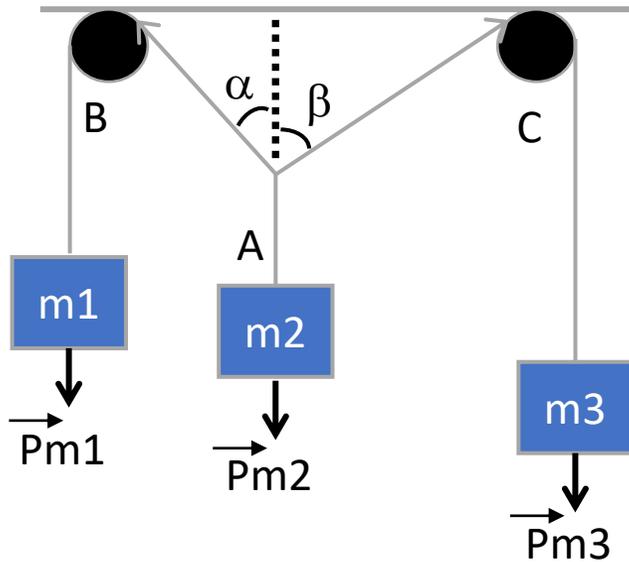


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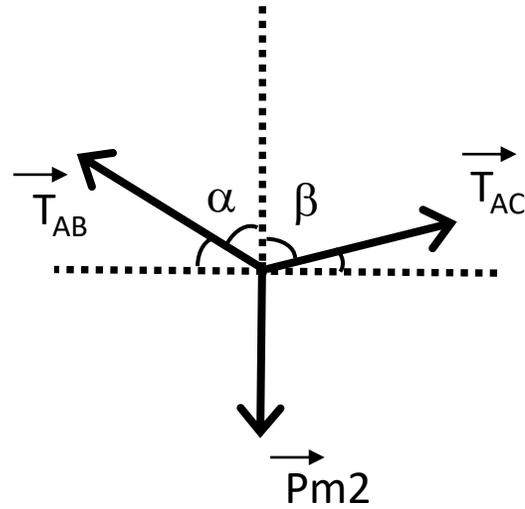
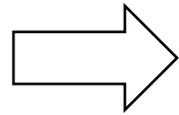
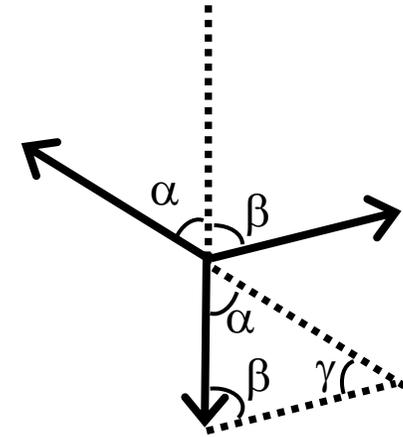
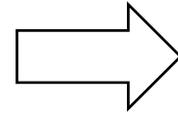


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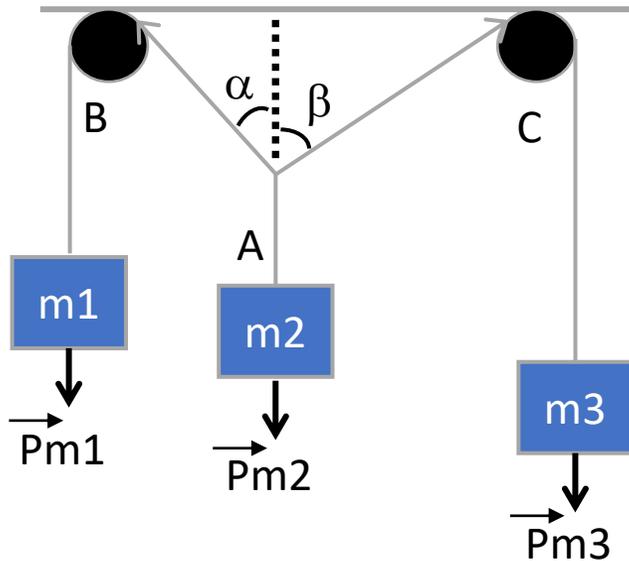


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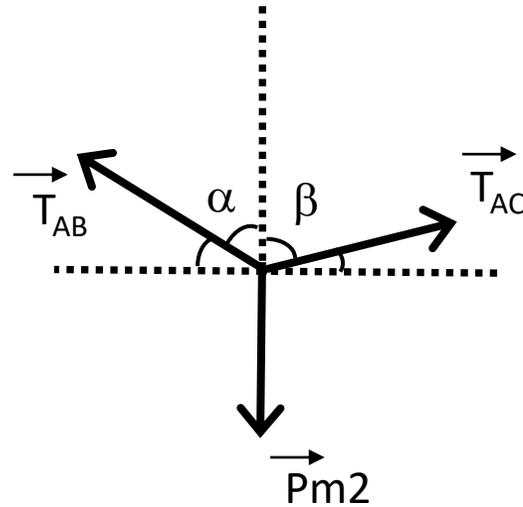
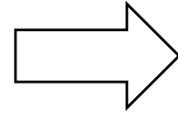
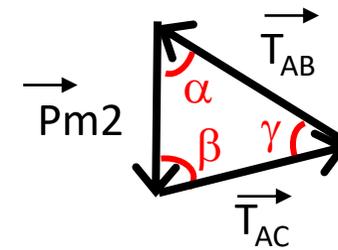
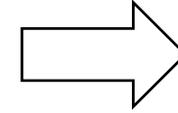


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Triângulo de forças

Lei dos senos

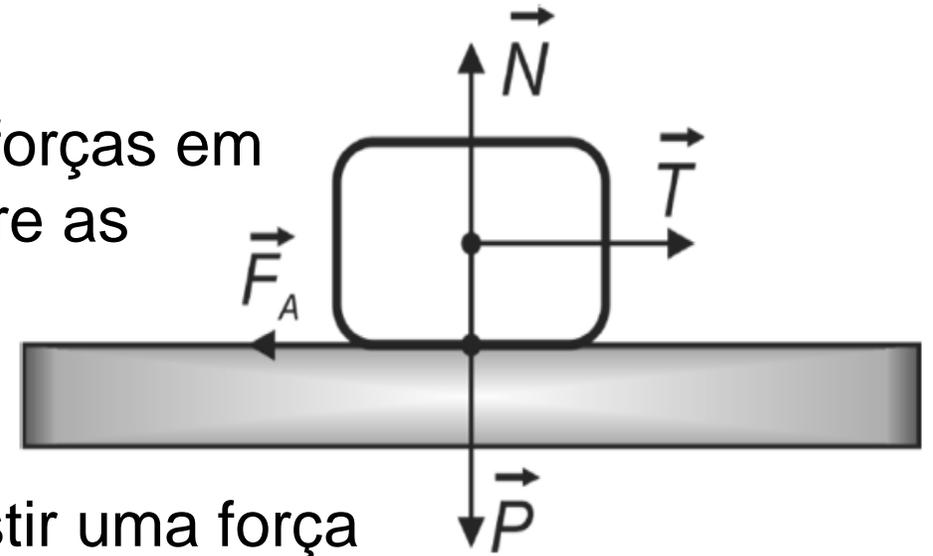
$$\frac{\vec{T}_{AC}}{\text{sen } \alpha} = \frac{\vec{T}_{AB}}{\text{sen } \beta} = \frac{\vec{P}_{m2}}{\text{sen } \gamma}$$

Força de atrito

Quando dois corpos são colocados em contato, forças em escala molecular são mutuamente exercidas entre as superfícies.

Um bloco, apoiado sobre um plano horizontal, sujeito a uma força de tração horizontal $T \rightarrow$.

Como o bloco se mantém em repouso, deve existir uma força líquida de atrito estático $F_A \rightarrow$ atuando na direção horizontal, compensando a tração. Experimentalmente, observa-se que:

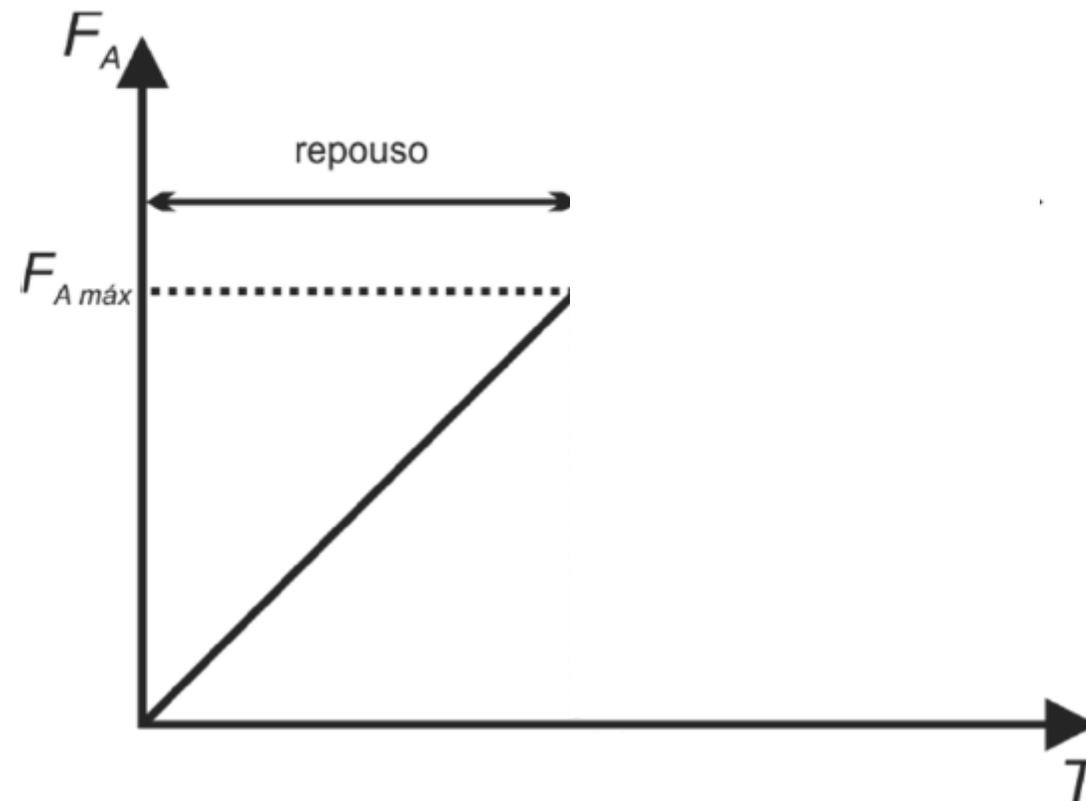


a) A condição de repouso, quando $F_A \rightarrow = T \rightarrow$, satisfaz-se até certo limite máximo $F_{Amáx} \rightarrow$

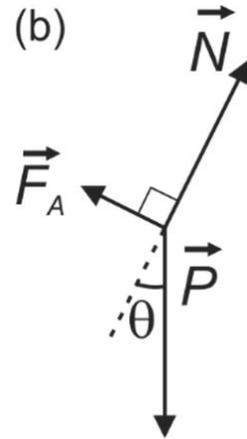
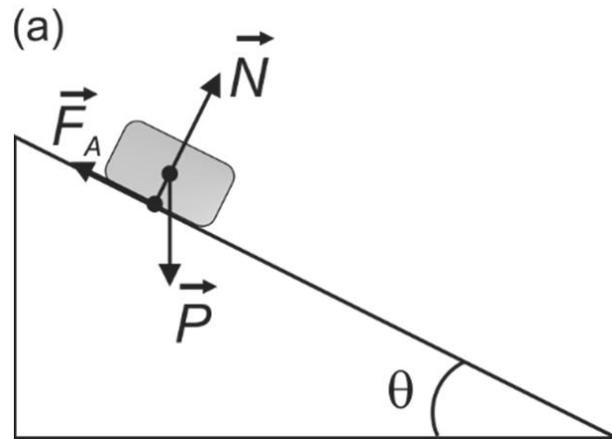
b) O limite máximo da força de atrito $F_{Amáx}$ depende da natureza das duas superfícies e é diretamente proporcional ao módulo da força normal.

Força de atrito

Figura 4.3 - Variação do módulo da força de atrito em função da intensidade da força de tração atuando sobre o corpo.



Coeficiente de atrito



No equilíbrio:

$$\vec{F}_{\text{at}} = \mu \times \vec{N}$$

$$F_{\text{at}} = \mu \times P \times \cos \theta$$

$$P \times \sin \theta = \mu \times P \times \cos \theta$$

$$\mu = \frac{\sin \theta}{\cos \theta} = \text{tg } \theta$$