

$$x_1 = l_1 \sin \theta_1$$

$$y_1 = -l_1 \cos \theta_1$$

$$x_2 = l_1 \sin \theta_1 + l_2 \sin \theta_2$$

$$y_2 = -l_1 \cos \theta_1 - l_2 \cos \theta_2$$

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$$1: x: F_{x1} = -T_1 \sin \theta_1 + T_2 \sin \theta_2 = m_1 \ddot{x}_1$$

$$1: y: F_{y1} = T_1 \cos \theta_1 - T_2 \cos \theta_2 - W_1 = m_1 \ddot{y}_1$$

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$$2: x: F_{x2} = -T_2 \sin \theta_2 = m_2 \ddot{x}_2$$

$$2: y: F_{y2} = T_2 \cos \theta_2 - W_2 = m_2 \ddot{y}_2$$

• For mass 1:

$$\frac{\vec{F}_1}{m_1} = \ddot{\vec{x}}_1 = \dot{\vec{v}}_1$$

$$\vec{F}_1 = \begin{pmatrix} F_{x_1} \\ F_{y_1} \end{pmatrix}$$

$$\textcircled{1} : \dot{\vec{v}}_1 = \frac{\vec{F}_1}{m_1} \Rightarrow \frac{\Delta \vec{v}_1}{\Delta t} = \frac{\vec{F}_1}{m_1} \Rightarrow \vec{v}_{\text{new}_1} = \vec{v}_{\text{old}_1} + \frac{\vec{F}_1}{m_1} \Delta t$$

$$\textcircled{2} : \dot{\vec{x}}_1 = \vec{v}_1 \Rightarrow \frac{\Delta \vec{x}_1}{\Delta t} = \vec{v}_1 \Rightarrow \vec{x}_{\text{new}_1} = \vec{x}_{\text{old}_1} + \vec{v}_1 \Delta t$$

• For mass 2 :

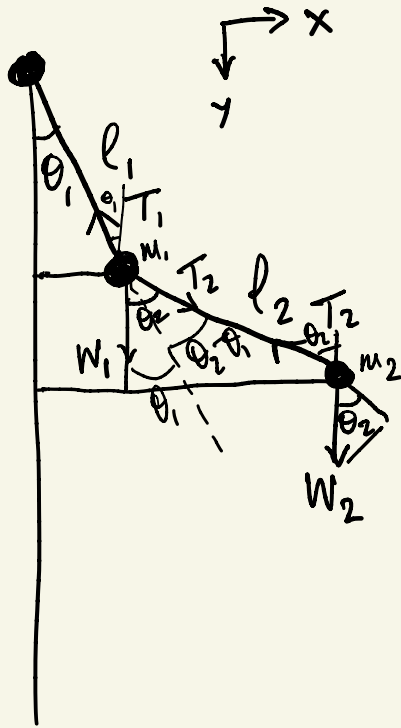
$$\frac{\vec{F}_2}{m_2} = \ddot{\vec{x}}_2 = \dot{\vec{v}}_2$$

$$\vec{F}_2 = \begin{pmatrix} F_{x_2} \\ F_{y_2} \end{pmatrix}$$

$$\textcircled{1} : \dot{\vec{v}}_2 = \frac{\vec{F}_2}{m_2} \Rightarrow \frac{\Delta \vec{v}_2}{\Delta t} = \frac{\vec{F}_2}{m_2} \Rightarrow \vec{v}_{\text{new}_2} = \vec{v}_{\text{old}_2} + \frac{\vec{F}_2}{m_2} \Delta t$$

$$\textcircled{2} : \dot{\vec{x}}_2 = \vec{v}_2 \Rightarrow \frac{\Delta \vec{x}_2}{\Delta t} = \vec{v}_2 \Rightarrow \vec{x}_{\text{new}_2} = \vec{x}_{\text{old}_2} + \vec{v}_2 \Delta t$$

• To find  $T_1, T_2$ :



First:

$$T_2 = W_2 \cos \theta_2$$

Then:  $T_1 = W_1 \cos \theta_1 + T_2 \cos(\theta_2 - \theta_1)$

$$T_1 = W_1 \cos \theta_1 + W_2 \cos \theta_2 \cos(\theta_2 - \theta_1)$$

