PhysH308

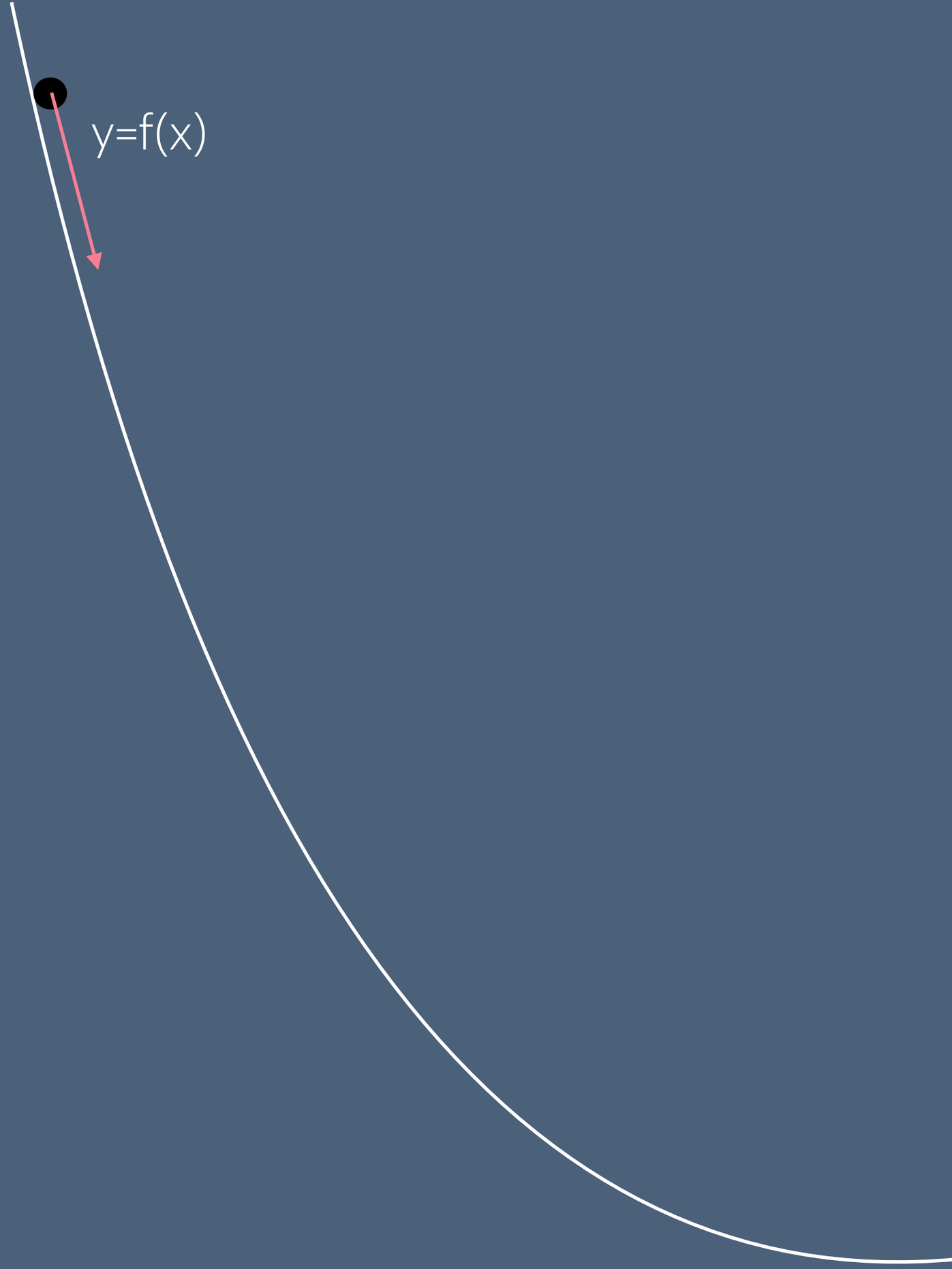
Energy

Ted Brzinski, Sept 24, 2024

Curvilinear coordinates

Identify constraints → reduce the dimensionality → describe the motion *along the path*

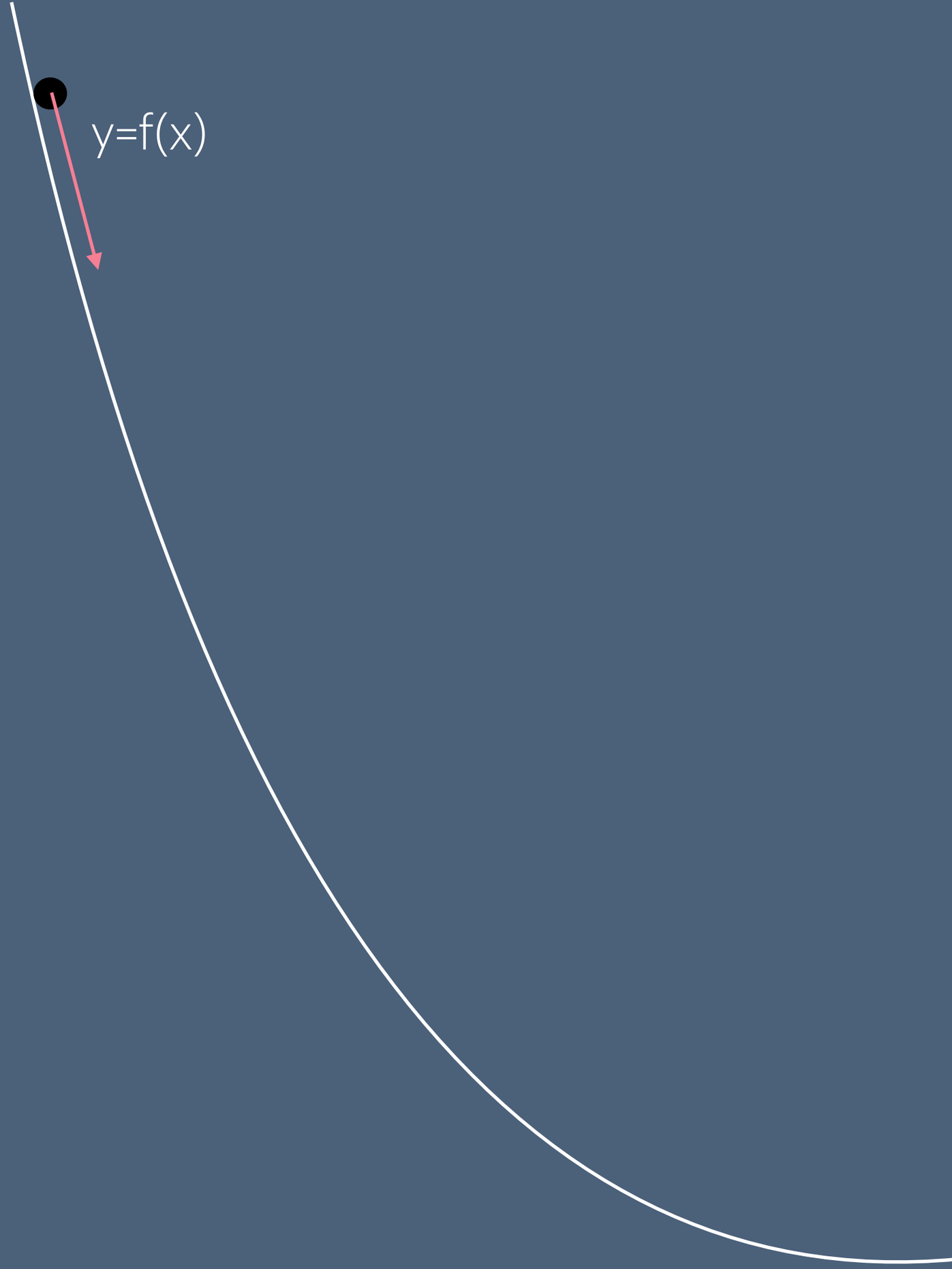
- $U = mgy = mgf(x)$
- $T = \frac{1}{2} m \left(\dot{x}^2 + \dot{y}^2 \right)$



Curvilinear coordinates

Identify constraints → reduce the dimensionality → describe the motion *along the path*

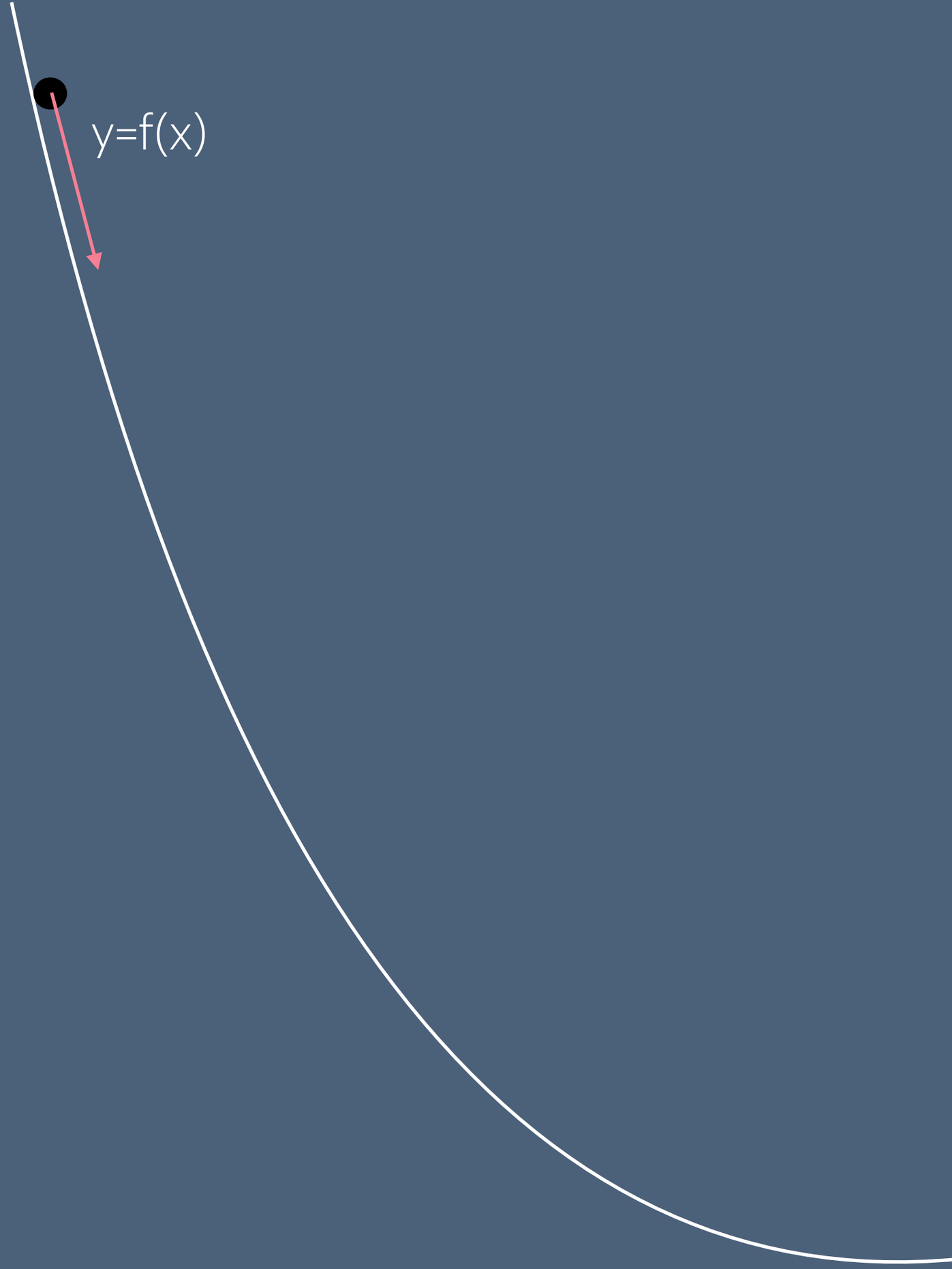
- $U = mgy = mgf(x)$
- $T = \frac{1}{2} m \left(\dot{x}^2 + \left(\frac{dy}{dx} \right)^2 \dot{x}^2 \right)$



Curvilinear coordinates

Identify constraints → reduce the dimensionality → describe the motion *along the path*

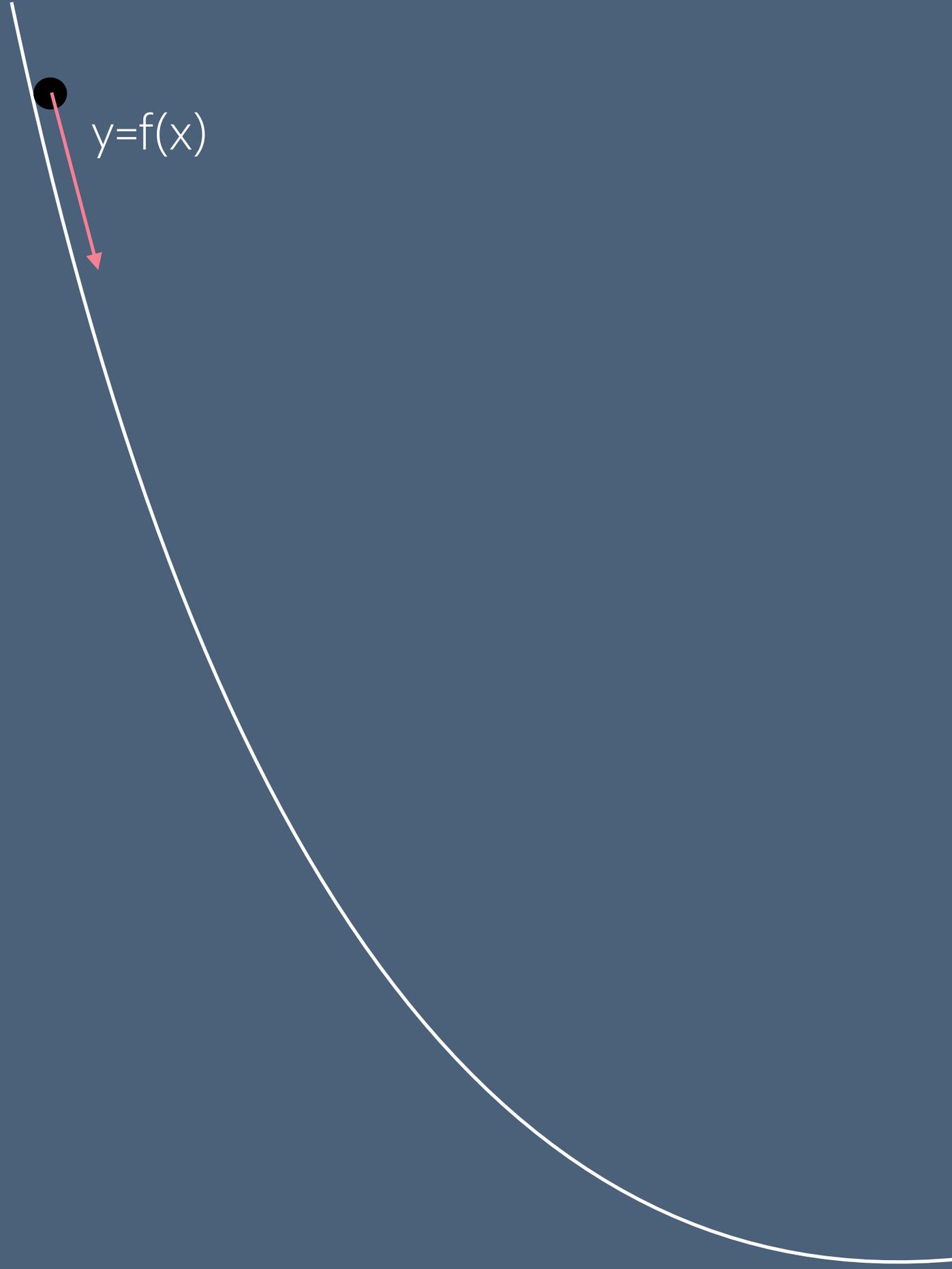
- $U = mgy = mgf(x)$
- $T = \frac{1}{2} m \left(\dot{x}^2 + f'^2(x) \dot{x}^2 \right)$



Curvilinear coordinates

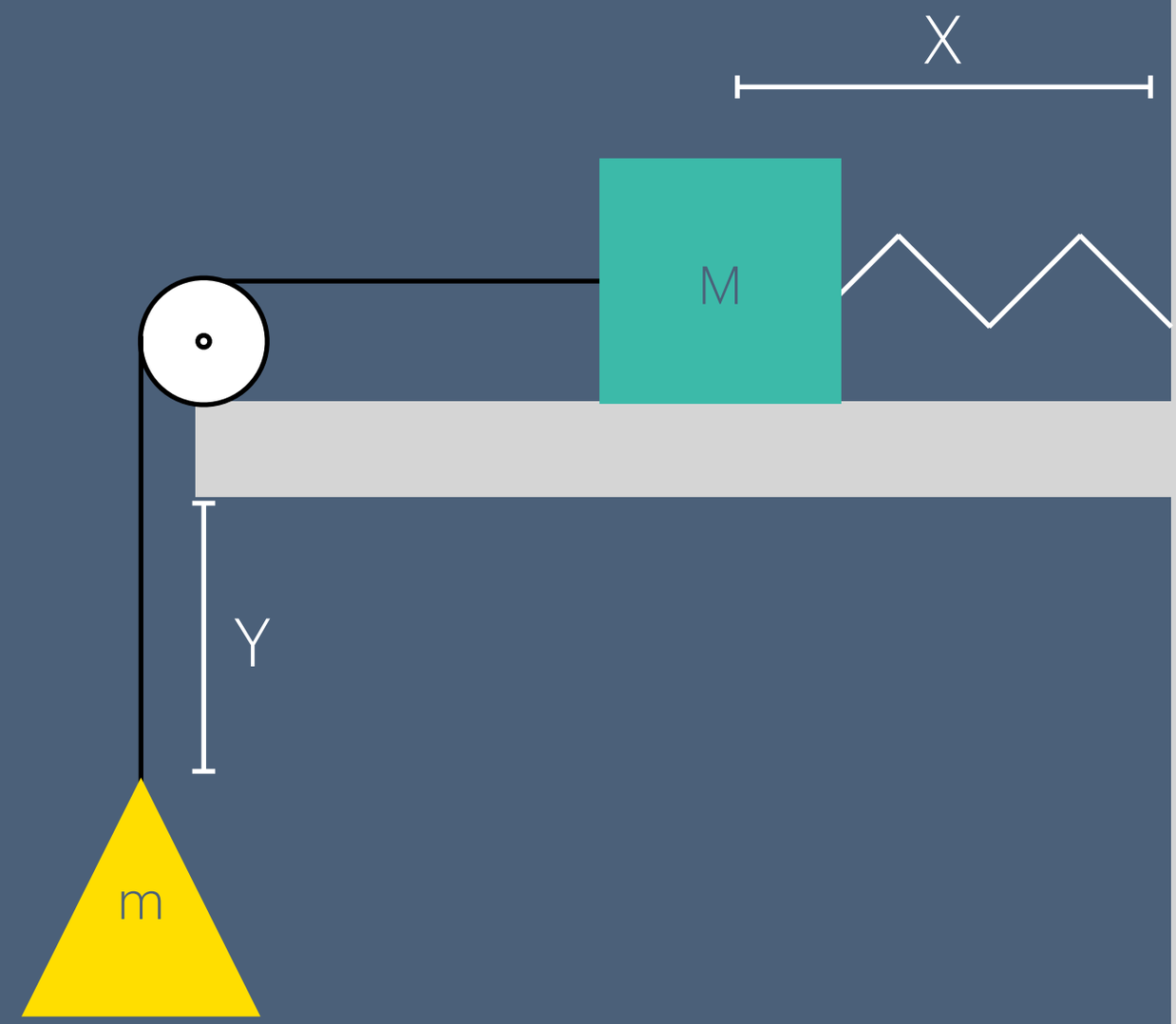
Identify constraints → reduce the dimensionality → describe the motion *along the path*

- $U = mgy = mgf(x)$
- $T = \frac{1}{2} m\dot{x}^2 \left(1 + f'^2(x)\right)$



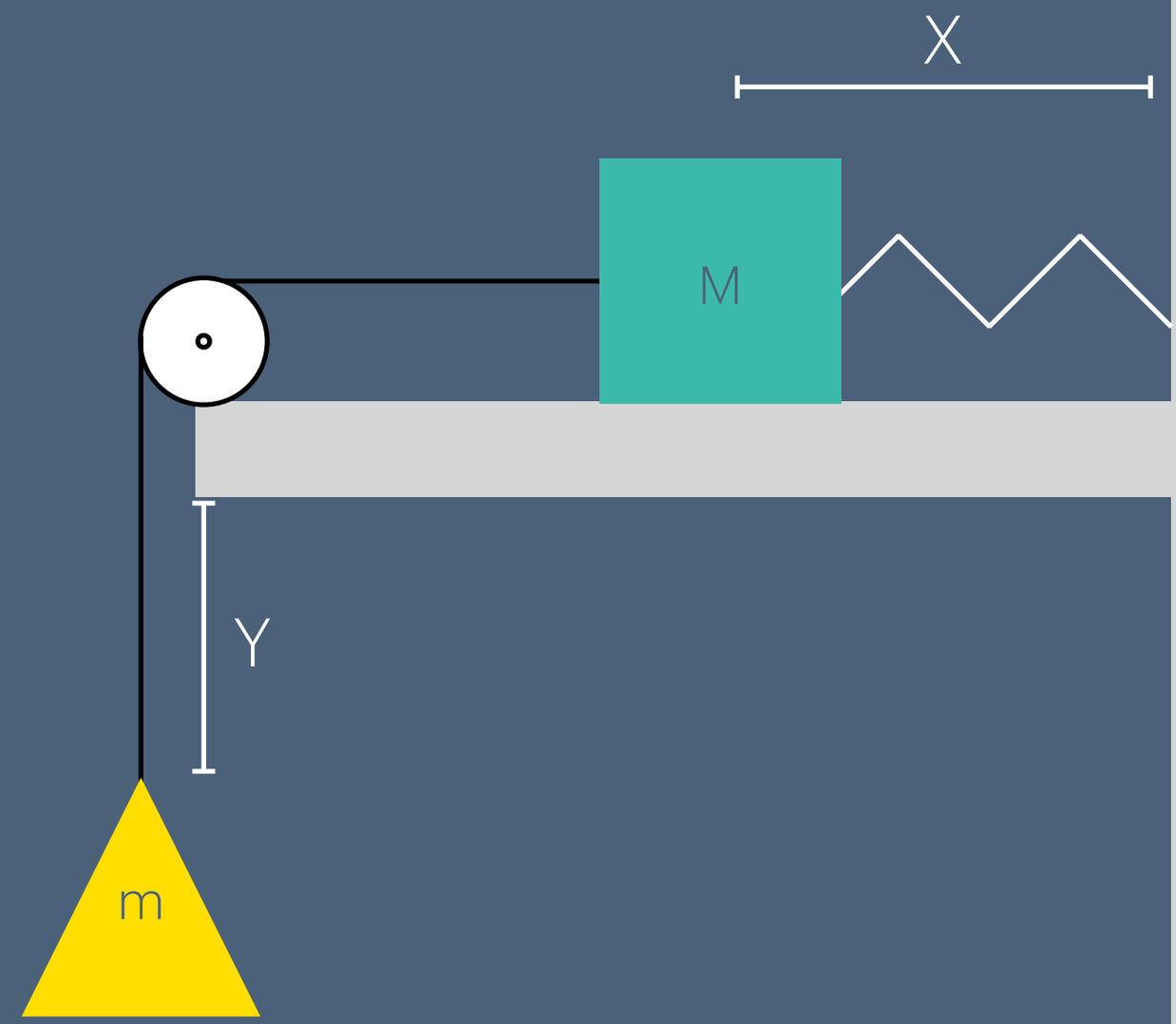
Curvilinear coordinates

- $U_M = \frac{1}{2}kx^2$
- $U_m = -mgy$
- $T_M = \frac{1}{2}m\dot{x}^2$
- $T_m = \frac{1}{2}m\dot{y}^2$



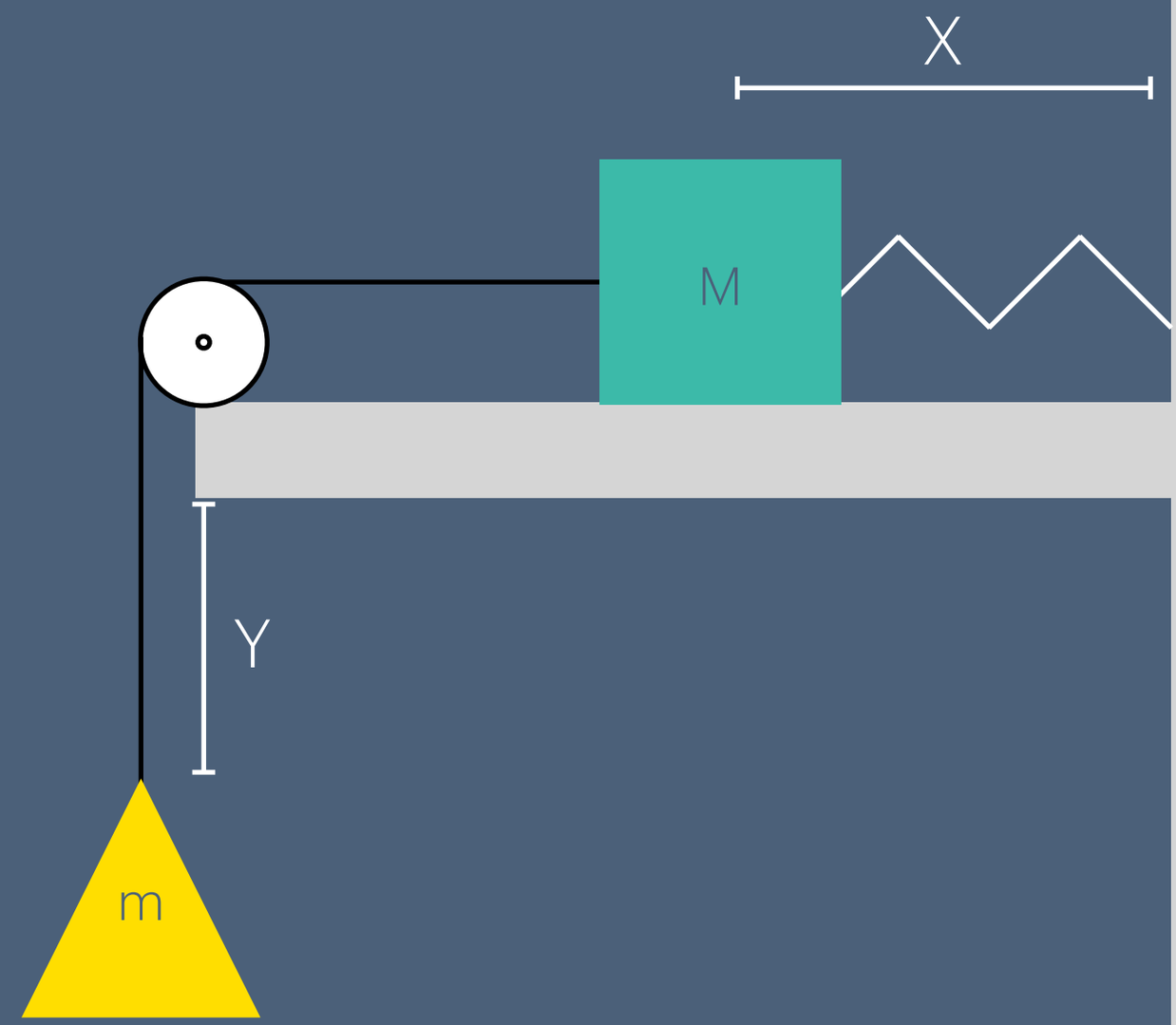
Curvilinear coordinates

- $U_M = \frac{1}{2}kx^2$
- $U_m = -mgy$
- $T_M = \frac{1}{2}m\dot{x}^2$
- $T_m = \frac{1}{2}m\dot{y}^2$
- $y = x$



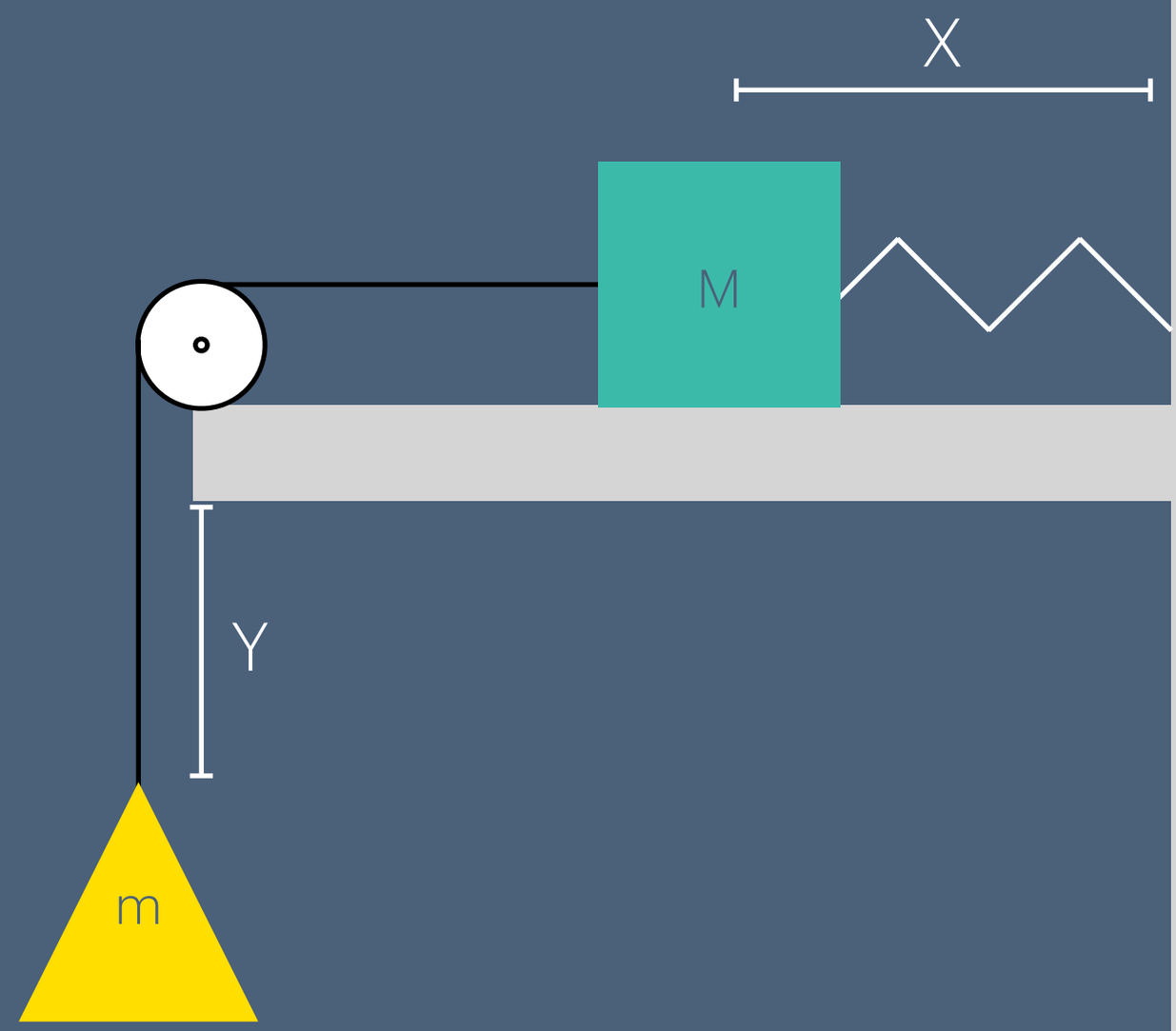
Curvilinear coordinates

- $U_M = \frac{1}{2}kx^2$
- $U_m = -mgx$
- $T_M = \frac{1}{2}m\dot{x}^2$
- $T_m = \frac{1}{2}m\dot{x}^2$
- $y = x$



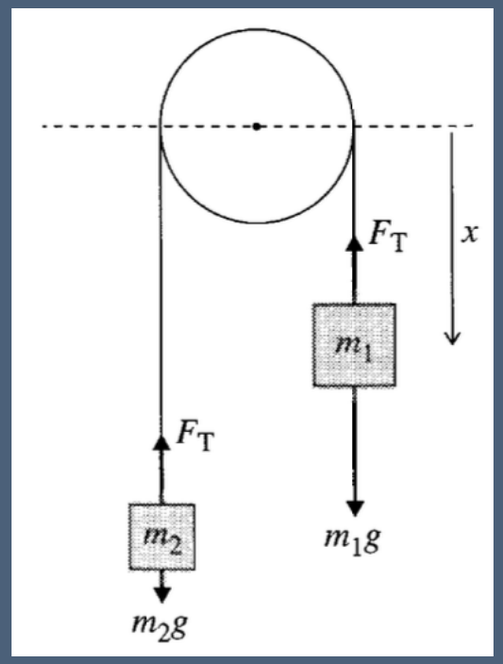
Curvilinear coordinates

- $U = \frac{1}{2}kx^2 - mgx$
- $T_M = m\dot{x}^2$



Today's problems

- 4.31



- 4.32