

# MECA-H303 TP2

## Lagrange dynamics

### Pendulum with mass spring

For the following mechanism, we ask you to:

1. Write the Lagrangien
2. Write the equations of motion

Additional details for the exercise:

- The inertias are given with respect to the centre of gravity of the related body
- The free length of the spring is at the position  $x = 0$
- Consider  $x \ll l$

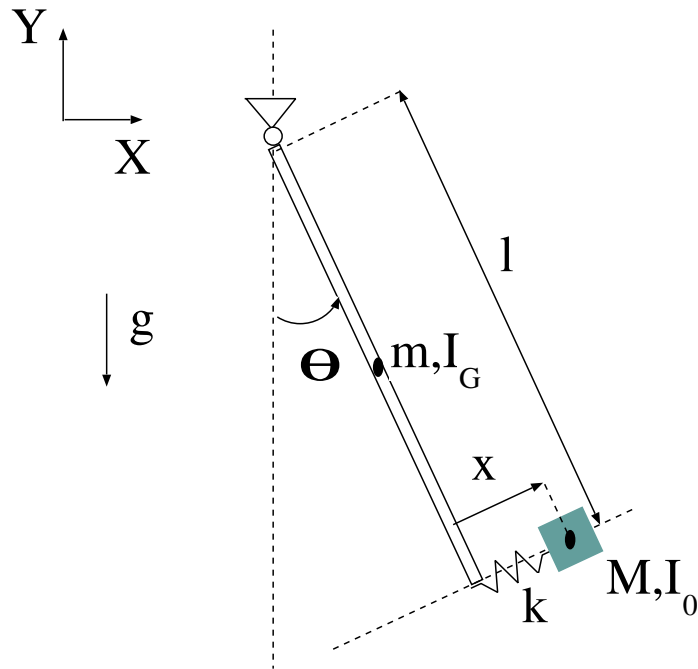


Figure 1: pendulum mass spring

## Double pendulum inverted on a cart

For the following mechanism, we ask you to:

1. Write the Lagrangien
2. Write the equations of motion

Additional details for the exercise:

- The mass of all bars is negligible
- Black circles attached to the bars have a mass  $m$

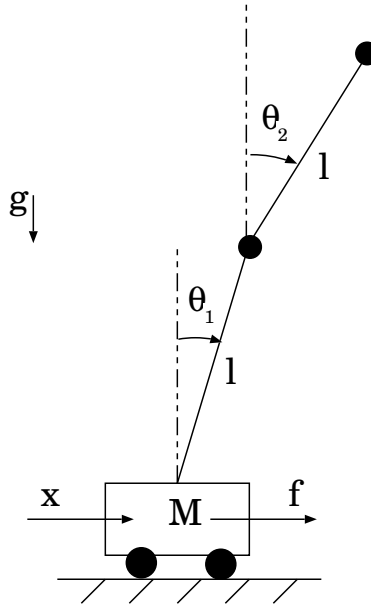


Figure 2: double pendulum inverted on a cart