1 Description of the system

The considered system is represented in figure 1. As you can see it consists of a double pendulum with an additional degree of freedom: a general rotation of the mechanism. The bars $A$ et $B$, defined by a length $L$ and by a mass $m$, are attached together by a revolute joint of horizontal axis. The bar $A$ is attached to the ground by two revolute joints: the first is a classical joint with horizontal axis, the second allows a constant rotation $\omega$ of vertical axis. From any configuration, the mechanism stabilizes as particular values of $q_1$ et $q_2$.

![Figure 1: Schéma du double pendule en rotation](image)

2 Requested results

It is asked to verify que $q_1$ et $q_2$ are determined\(^1\) by

\[
\frac{L\omega^2}{g} \cos q_1 (8 \sin q_1 + 3 \sin q_2) - 9 \sin q_1 = 0
\]

\(^1\)To stabilize the mechanism, the addition of a torsional damper between the two bodies is allowed.
et

\[ \frac{L \omega^2}{g} \cos q_2 (3 \sin q_1 + 2 \sin q_2) - 3 \sin q_2 = 0 \]  

(2)

Numerically, for \( L \omega^2/g = 3 \) (\( L = 100 \text{ mm} \) et \( \omega = 17,1522 \text{ rad/s} \)), that comes down to verify \( q_1 = 74,25^\circ \) et \( q_2 = 78,34^\circ \).

### 3 Typical results

Figures 2 to 4 give the expected evolutions of the configuration parameters and their time derivatives. We can see a stabilization on previous values.

![Figure 2: Evolution of configuration parameters](image-url)

Figure 2: Evolution of configuration parameters
Figure 3: Evolution of first time derivatives of configuration parameters

Figure 4: Evolution of second time derivatives of configuration parameters