1. Implement high gain, high frequency, and adaptive controller in MATLAB simulation for (a) and (b) with ground truth $m = 2$, $l = 1$, $M = 3$, $q_d(t) = \sin(t) + \cos\left(\frac{t}{2}\right)$.

(a) Given a system with dynamics $m\ddot{q} + mgl\sin(q) = \tau$, where $g \in \mathbb{R}$ is the gravity, m, $l \in \mathbb{R}$ are unknown constants, and $q, \dot{q} \in \mathbb{R}$ are measurable states. Please design an adaptive controller to track some desired trajectory q_d.

(b) Given a system with dynamics $m\ddot{q} + M\sin(q) = u$, where $m, M \in \mathbb{R}$ are unknown constants, and $q, \dot{q} \in \mathbb{R}$ are measurable states. Please design an adaptive controller to track some desired trajectory q_d.