

Homework Set 1 – 536 students only

Due date: Monday 27 January

Type your responses to the extent possible. If necessary, leave blank space in the document to write equations by hand.

5. (10 pts) The pendulum equation is $\frac{d^2\theta}{dt^2} = -\frac{g}{L}\sin\theta$, where $\theta(t)$ is the angle made by a pendulum bob and L is the length of the pendulum. We will derive this equation in class soon.
- (a) Find a time scale T to rescale time t to τ so that the equation becomes $\ddot{\theta} = -\sin\theta$. Verify that τ is dimensionless. Note that θ is already dimensionless because it is in radians.
- (b) Using the small angle approximation $\sin\theta \approx \theta$, find the general solution of the dimensionless equation, and then write it in terms of the original variables.