

3. (5 points) From class, we know a simple pendulum of length ℓ and mass m satisfies $\frac{m\ell^2}{2} \left(\frac{d\theta}{dt}\right)^2 + mg\ell(1 - \cos\theta) = \text{constant}$. Show that any non-constant motion $\theta(t)$ must satisfy $\frac{d^2\theta}{dt^2} + \frac{g}{\ell} \sin\theta = 0$. (Hint: use implicit differentiation with respect to t .)

4. (5 points) Find the general solution of $x' = \frac{t^3(1+x^3)}{x^2}$.

5. (5 points) Book Problems:

- Sect 1.2 #2, 3, 7, 9, 11
- Sect 2.1 #1, 3, 5, 9, 13, 15, 21