Homework 5

Due February 6th

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a. **Application**: For the pendulum equation

$$\theta'' + \sin\theta = 0 \tag{1}$$

$$\theta(0) = 1, \quad \theta'(0) = 2 \tag{2}$$

it is known that the following is conserved:

$$\frac{1}{2}(\theta'(t))^2 - \cos\theta(t) = \frac{1}{2}(\theta'(0))^2 - \cos\theta(0) = 2 - \cos(1)$$

Show using RK2 then RK4 that this quantity is conserved. Show that conservation gets better for smaller and smaller values of h.

b. **Code**: Write your own implementation of Gaussian Elimination on tridiagonal matrices. Also, write a general purpose PLU decomposition function.