

18.085 MATLAB 2.2

Due WED Oct 10

This is about $Mu'' + Ku = 0$ with $M = \begin{bmatrix} 1 & 0 \\ 0 & 4 \end{bmatrix}$ and $K = \begin{bmatrix} 4 & -4 \\ -4 & 16 \end{bmatrix}$.

1. Find the eigenvalues λ_1, λ_2 and eigenvectors x_1, x_2 of $M^{-1}K$ by `eig(K,M)` and check that $x_1^T M x_2 = 0$. They solve $Kx = \lambda Mx$
2. Use the `normalmodes` code on math.mit.edu/cse (and in Section 2.2) to solve $Mu'' + Ku = 0$ starting from $u = (1, 0)$ and $u' = (0, 0)$. Find the solution vector u at $t = 1$ and $t = 2$.
3. Test the trapezoidal code and the leapfrog code (same cse page and 2.2) on the same problem. Which one is more accurate? Both should be second order methods. Use a small enough time step for leapfrog to be stable, and also a large enough step to see instability.