- Zip all your files and label the zip file as **[Roll number in lower case]_hw7.zip**
- The scripts will be executed and compared against the submitted PDF file.
- Submit a single zip file containing `.tex, .m, .pdf` and image files only.
- Generic instructions from previous homeworks stand.
- **This assignment is to be done entirely in Octave**

This assignment involves the following tasks,

1. **Coding:** Write a function that takes in a square matrix A and a vector b, and computes $x = A^{-1}b$ using QR decomposition.
2. **Validation:** For matrix size n ranging from 1–1,000, plot the L_∞ error in x between your QR-code and `A\b` operation in Octave. What does this backslash operator do in Octave?
3. **Timing-I:** Compare the computational time against matrix size n (1–1,000) for four separate methods: 1. Your QR code, 2. Octave's inbuilt QR code, 3. `inv(A)*b`, and 4. `A\b`. See below to create random invertible matrices. Note: The timings should only involve the time taken to run the QR code and not pre-processing, plotting, etc. You may loop the section a few times and take the average, if required. Comment on your results.
4. **Timing-II:** For your QR-code create a plot that shows the: 1. Total computational time, 2. Time for generating Q and R, and 3. Time for back-substitution and solving for x against matrix size n. You should be able to get this information when you perform Task 3. Comment on your results.

Random Square Matrix: To create a random invertible $n \times n$ matrix, define $A_n = I_n - \mathbf{v}\mathbf{v}^\mathbf{T}$, where $\mathbf{v}$ is a randomly generated $n \times 1$ vector and I_n is the identity matrix of size n.

Error Definition: The L_∞ error between two vectors $\mathbf{x}$ and $\hat{\mathbf{x}}$ arrays is defined as

$$L_\infty = \max(|x_i - \hat{x}_i|) \quad \forall\, i = 1, 2, \cdots, n$$