Problem 1

This problem makes more sense when you consider what a "matrix norm" is.

First, let's define the 2-norm of a vector x in $\mathbb{R}^n$ to be

$$\sqrt{\sum_{i=0}^{n} x_i^2}$$

In English, this says that the 2-norm of a vector is its length in $\mathbb{R}^n$.

Given this definition of a vector 2-norm, we can define the matrix 2-norm as

$$\|A\|_2 = \max_{x \neq 0} \frac{\|Ax\|_2}{\|x\|_2}$$

In other words, the 2-norm is the maximum amount of "stretch" or "extension" that a matrix does to a vector. If there is some vector which increases its length by a factor of 3 when multiplied by the matrix A, then the 2-norm of the matrix is (at least) 3.

This definition is equivalent to the definition presented in the original problem.

As you work this problem, consider how that relates to the eigenvalues of the matrix.

Problem 2

For part (a), you don't need to do anything other than to write the formulae for the internal/external/total response, and indicate what the matrices A, B, C, and D are. Since the input isn't specified, you can't calculate a specific output.

Please turn in your plots (at least four, one for each case) and a printout of your Matlab code.