ECSE597/ECSE472
Assignment #5 part a

Question I

A linear circuit has poles at S=-5, -3, -2, -7, and -8.

i.   If the circuit is simulated using the Forward Euler method with step size h, for what values of h is the simulation stable?

ii.   If the circuit is simulated using the Backward Euler method with step size h, for what values of h is the simulation stable?

iii.   If the circuit is simulated using the Trapezoidal Rule with step size h, for what values of h is the simulation stable?

Question II

Consider the following Adams-Moulton integration method:

$$x_n = x_{n-1} + \frac{5h}{12}\dot{x}_n + \frac{8h}{12}\dot{x}_{n-1} + \frac{h}{12}\dot{x}_{n-2}$$

Derive the difference equation corresponding the to the above method.

Question III

Your circuit simulator needs to perform an AC analysis at 1000 frequency points, as well as compute the sensitivity of 5 output nodes with respect to three different parameters. What is the total number of Sparse orderings, L/U factorizations and forward backward substitutions required for the full computation (including both the frequency response and its sensitivity) if:

1. We use the perturbation method.
2. We use the differentiation method.
3. We use the Adjoint method.