Problem 1: Given a system $\frac{dx}{dt} = \begin{bmatrix} 0 & 1 & 2 \\ 0 & -2 & 3 \\ 0 & 0 & 0 \end{bmatrix} x + \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix} u$ **and the vector output** $y = [0 \quad 1 \quad 0]x + 2u$

a. What are the eigenvalues of matrix A?
b. Compute the transfer function G(s).
c. Find the pole(s) of the transfer function.
d. Explain the difference you see between the eigenvalues of A and the poles of the system.
e. Is the system BIBO stable? Why?

Problem 2: If the output of the system in problem 1 is changed into $y = [1 \quad 0.5 \quad 0]x$

a. What is the new transfer function?
b. Find the poles.
c. Is the system with new output still BIBO stable? Why?
d. Compare the BIBO stability of the systems from both problems. Explain why they are identical/different.