October 3, 2020

AAE 564 Fall 2020

Homework Six

Due: Friday, October 9

Exercise 1 Consider a mechanical/aerospace system described by

$$M\ddot{q} + C\dot{q} + Kq = 0$$

where $q(t)$ is an N-vector and M, C and K are square matrices. Suppose λ is a complex number which satisfies

$$\det(\lambda^2 M + \lambda C + K) = 0\,.$$

Show that the above system has a solution of the form

$$q(t) = e^{\lambda t} v$$

where v is a constant N-vector.

Exercise 2 Suppose A is a 3×3 matrix and

$$\det(sI - A) = s^3 + 2s^2 + s + 1$$

(a) Express A^3 in terms of I, A, A^2.

(b) Express A^5 in terms of I, A, A^2.

(c) Express A^{-1} in terms of I, A, A^2

Exercise 3 Without doing any matrix multiplications, compute A^4 for

$$A = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 564 & 1 & 0 & 0 \end{pmatrix}$$

Justify your answer.