Last Name (PRINT): _____

First Name (PRINT): _____

Spring 2017 – Winter Analysis
First Examination

Instructions

1. The use of all electronic devices is prohibited. Any electronic device needs to be turn off and placed in your bag. Any textbooks or notes also need to be placed in your bag with the exception of one double sided handwritten cheat sheet.

2. Present your solutions in the space provided. Show all your work neatly and concisely. Clearly indicate your final answer. You will be graded not merely on the final answer, but also on the quality and correctness of the work leading up to it.

Scholastic dishonesty will not be tolerated and may result in terminating the midterm early. The work on this test is my own.

Signature:_____

Grade:

Exercise 1. (4 points) Transform the given differential equation or system into an equivalent system of first order differential equations. Give your answer in matrix notation.

$$\begin{cases} x'' - 2x' + 5y' + x = 0 \\ y'' + 7y' - 3y + 2x = 0 \end{cases}$$

Do not solve the system.

Exercise 2. (5 points) Find the general solution to

$$X' = \begin{pmatrix} -3 & 5 \\ -2 & -1 \end{pmatrix} X.$$

Exercise 3. (5 points) Find the solution to the initial value problem

$$X' = \begin{pmatrix} 5 & 1 \\ -4 & 1 \end{pmatrix} X, \qquad X(0) = \begin{pmatrix} 0 \\ -2 \end{pmatrix}$$

Exercise 4. (6 points) Find the general solution to the system

$$X' = \begin{pmatrix} -1 & 0 \\ 3 & -2 \end{pmatrix} X + \begin{pmatrix} t \\ -3t \end{pmatrix}$$

Exercise 5. (5 points) Find the general solution to

$$X' = AX \qquad \text{with } A = \begin{pmatrix} 0 & -1 & 0 \\ -1 & 0 & 0 \\ 2 & -2 & -1 \end{pmatrix}$$

Hint: $det(A - rI) = (r+1)^2(r-1)$.