PRAIRIE VIEW A&M UNIVERSITY
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

DOCTORAL PRELIMINARY EXAM – Fall 2016

ENGINNERING M ATHMETICS

Name: _____

Answer all of the following questions.

1. Solve the initial value problem

$$y''+0.4y'+9.04y=0, \qquad y(0)=0, y'(0)=3$$

2. An experiment leads to the CDF (cumulative distribution function) of Y as

$$F_Y(y) = \begin{cases} 0, & y < 0, \\ y^3, & 0 \le y \le 1 \\ 1, & y > 1 \end{cases}$$

(a) Find the PDF (probability density function) of Y
(b) Calculate the probability that Y is between ¼ and ¾.

3.a. Find the eigenvalues and eigenvectors of the matrix and the stated of power A.

$$A = \begin{bmatrix} 1 & -3 & 3 \\ 3 & -5 & 3 \\ 6 & -6 & 4 \end{bmatrix}$$

$\mathbf{A}^{25}$

b) Find the exact value of the following series:

$$\frac{4}{5} - \frac{16}{25} + \frac{64}{125} - \frac{256}{625} + \cdots$$

4. Find the Fourier series for (periodic extension of)

$$f(t)=\begin{cases} t-1, & t\in[0,2) \\ 3-t, & t\in[2,4) \end{cases}$$

Determine the sum of this series.

b. Use Laplace transform to solve the initial value problem $x'' - 6x' + 8x = 2$
$x(0) = x'(0) = 0$.