

**Department of Electrical & Computer Engineering
Prairie View A&M University**

**Ph.D. Preliminary Examination
in
Mathematics
Fall 2013**

Write legibly.

No points will be given for answers that show no work.

**Do not use cell phone during the examination.
(Calculator will be provided upon request.)**

Note: Each problem is worth 20 points.

Name: _____ Date: October 25, 2013

1. Solve the initial value problem

$$y'' + y' - 2y = 0, \quad y(0) = 4, \quad y'(0) = -5$$

2. (a) Find the inverse of the matrix $A = \begin{bmatrix} -1 & 1 & 2 \\ 3 & -1 & 1 \\ -1 & 3 & 4 \end{bmatrix}$ and

(b) Check the answer by direct multiplication.

3. A type of lightbulb is labeled as having an average lifetime of 1000 hours. It is reasonable to model the probability of failure of these bulbs by an exponential density function

$$f(t) = \begin{cases} ce^{-ct} & \text{if } t \geq 0 \\ 0 & \text{if } t < 0 \end{cases}$$

with mean $\mu = 1000$.

- a) Find c
- b) Find the probability that a bulb fails within the first 200 hours,
- c) Find the probability that a bulb burns for more than 800 hours.
- d) What is the median lifetime of these lightbulbs?

4. Evaluate $\int_0^1 \int_{3y}^3 e^{x^2} dx dy$

5. Determine the trigonometric Fourier series of the signal shown below.



