**LaGuardia Community College**

MAT 212 Linear Algebra and Vector Analysis for Engineers

Term Project

**Dominant Eigenvalue Computation**

June 6, 2014

**Objective:**

i. In this project, I will apply the Power Method to estimate the dominant eigenvalue (uk) and a corresponding eigenvector (xk) for the matrix A and initial vector x0 below. I will stop at k = 5, using 5 decimal places maximum.

The matrix A and the initial vector x0 for this project appear as:

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ii. I will use the characteristic equation to find the exact value of the dominant eigenvalue and compare it with my estimation in part one.

iii. I will use ‘Maple 14’.

**Part One: Applying the Power Method (Using Maple 14)**

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**>**

 [Estimated Eigenvalue]

**>**

 [Estimated Eigenvector]

**Part Two: Using Characteristic Equation**

- λ I = 0 ; [A – λ I ] =

det [A – λ I ] =0;

* (8 – λ) [ (2– λ) (–λ) – 3] – 0 + 12 (3- 0) =0
* 16λ + 8λ2  –2λ2 – λ3 –24 + 3λ + 36= 0;
* –λ3 – 6λ2 + 19λ + 12 = 0;
* (–λ – 1) (λ2 – 7λ – 12) = 0;
* λ = –1;

λ = 8.4244 or λ = – 1.4244

**Conclusion:**

From Part One (using Power Method), I obtain:



From Part Two (using Characteristic Equation), I have (the highest eigenvalue):

**λ = 8.4244**

Finally, the values are approximately the same. On the other hand, by using the power method, we will find a sequence {uk} which converges to the highest absolute eigenvalue.