Concordia University

Department of Mechanical and Industrial Engineering

ENGR 391 Numerical Methods

Test 2

Instructions: Answer all questions. One, two-sided, formula sheet is allowed.

You have 2 hours to complete the test. Use 4 decimal place accuracy in all of your calculations.

1. Use 5 iterations of the Power method to estimate the dominant eigenvalue of the following matrix:

 **[8]**

Starting from the initial vector: **.**

Make a table showing the eigeinvalues for each iteration, as well as, the absolute

errors after each iteration.  **[2]**

1. Consider the following data:

|  |  |
| --- | --- |
| **xk** | **yk** |
| **-1** | **1** |
| **0** | **0** |
| **1** | **1** |
| **2** | **3** |

1. Find the Least Squared Fit to this data using the test function **[8]**
2. Calculate the r2-factor and use this to comment on how well the resulting

test function fits the data. **[2]**

1. Use the resulting test function to estimate the value of y at x = 0.5. **[1]**
2. Find the Newton Interpolating Polynomial that fits this data **[7]**
3. Use the resulting Newton Polynomial to estimate the value of y at x = 0.5. **[1]**
4. Compare and comment on the results found in c) and e). **[1]**
5. Find a point of intersection of the following circle and parabola, by solving as a non-linear system of equations, using 3 iterations of Newton’s Method; starting from the initial guess vector: ( 1 , -1 ).

 **[8]**

Use the norm to calculate the residual error after each iteration. **[2]**