Concordia University

Department of Mechanical and Industrial Engineering

ENGR 391 Numerical Methods

Test 1

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

You have 2 hours to complete the test.

1. Use LU decomposition to find  given:

 **[10]**

1. Consider the function ,
2. Find the first four non-zero term of its Taylor series about the point x = 0. **[5]**
3. Use this series to approximate. **[3]**
4. Calculate the relative percent error of your answer found in part b. when compared with the actual answer (The answer you get using your calculator). **[2]**

**[Use 5 decimal place accuracy in you calculations]**

1. Consider the function ,

1. Use the bracketing method to find an interval containing a *positive* root. **[3]**
2. Use three iterations of the *Regula Falsi* method to approximate this root; calculate the absolute error after each iteration. Give your answer in table form. **[7]**

**[Use 5 decimal place accuracy in you calculations]**

1. Given the system of linear equations:



1. Is this the optimal ordering of the equations for a Gauss-Seidel Iterative method? If not, explain why not, and re-arrange the equations into a more optimal order. **[2]**
2. Carry out *three* iterations of the Gauss-Seidel method, starting from an optimally ordered system of equations, with the initial vector Use the norm to calculate the residual error after each iteration. **[8]**

**[Use 3 decimal place accuracy in you calculations]**