Math 373 Final Exam May 6, 2014

1. Incremenation of partial differentials:
   1. Write the following partial derivative in incremental form and state on the line provided whether your response is a backward, central, or forward approximation.

\_\_\_\_\_\_\_\_\_\_\_\_ 

b) Provide an explicit solution for the new T resulting from putting the Heat Equation into incremental form.



1. Find a root of the following equation by any **two** numerical methods of your choice. To receive full credit you must layout the mathematical method clearly.

x3 - 2 ln (x) = 34

3. Find the integral for f(x)dx from x = 0 to 16 using Simpson's 1/3 Rule.

x 0 2 4 6 8 10 12 14 16

f(x) 30 12 26 56 64 50 45 44 48

4. Use the data below to estimate the value of f(6.6) using third order approximation (i.e. - cubic polynomial). Use any method you like.

x 0 2 4 6 8 10 12 14 16

f(x) 30 12 26 56 64 50 45 44 48

1. The rate of change of v with t is given below and that at t = 0, v = 300 find v when t = 0.2 by Runge-Kutta 4th Order using a step size of 0.2

= - 10 + t/2

6. Given the data below, what is the largest time step allowed in the simple explicit method of solving the Heat Equation when alpha = 0.25 cm2/sec and ∆x = ∆y = ∆z = 0.1 cm in

1. One dimension
2. Two dimensions
3. Three dimensions

7. Describe the purpose of the Guass-Quadrature Method and briefly how is it used?

8. Show how to solve the following set of linear equations using the Gauss-Seidel method

-x2 +2y + 5z3 = 18

2x + y2 = 6

7x3 +3y + 5z = 14

9. Correct any coding errors in the following curve-fit routine

RegEx.m

x=[10 20 30 40 50 60 70 80];

y=[25 70 380 550 610 1220 830 1450];

fminsearch(@fSSR, [1, 1], [], xm, ym)

fSSR.m

function f=fSSR(a,x,y)

yp=a1\*xm^a2;

fSSR=sum((ym-yp)^2);

10. Below are several LP tableaus in various states of completion.

Describe the next step for each or if they are completed state that.

a)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **X1** | **X2** | **X3** | **X4** | **S1** | **S2** | **S3** | **A1** | **A2** | **F** | **RHS** |
| 1 | 3 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 280 |
| 0 | 2 | 1 | 1 | 0 | -1 | 0 | 1 | 0 | 0 | 52 |
| 0 | 5 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 14 |
| 1 | 1 | 3 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 240 |
| -9 | -6 | -1 | -5 | 0 | 0 | 0 | 100 | 100 | 1 | 0 |

b)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **x** | **y** | **z** | **S1** | **S2** | **S3** | **F** | **RHS** |
| 1 | 0 | 2 | 12 | 3 | 0 | 0 | 20 |
| 0 | 1 | 1 | 21 | 1 | 0 | 0 | 54 |
| 0 | 0 | 6 | 0.6 | 5 | 1 | 0 | 100 |
| 0 | 0 | 15 | 58 | 6 | 0 | 1 | 2365 |

c)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **X1** | **X2** | **X3** | **S1** | **S2** | **S3** | **F** | **RHS** |
| 7 | 4 | 2 | 1 | 0 | 0 | 0 | 2000 |
| 2 | 10 | 1 | 0 | 1 | 0 | 0 | 250 |
| 0 | 2 | 6 | 0 | 0 | 1 | 0 | 160 |
| -60 | -50 | -2 | 0 | 0 | 0 | 1 | 0 |

**Scratch paper**