Math 373 HQ 3 April 25, 2014

**If a question is in error or unclear, state a professional fix for it and proceed. Proctor will not answer any questions.**

**Closed notes, closed book, no calculators**

1. Match

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

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

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

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

Regression

Data Adjustment

Artificial variable creation

SIMPLEX

Fibonacci

Runge-Kutta

ODE45

Big-M

A method -

a. that requires a cost coefficient that makes the artificial variable unattractive to the objective

b. of finding coefficients to minimize the sum of the squares of errors

c. a MATLAB function that performs RK integration

d. to solve ordinary differential equations

e. of finding the best values of multiple measured values of interdependent data

f. employed to create a basic feasible solution

g. that optimally searches a unimodal function

h. of to solve a problem with a linear objective, and only  linear constraints

1. Below are some measured flow data. There is an equation A + 2B = E, and C=D that is theoretically required to be satisfied. Describe how to arrive at the best values for A, B, C, D and E.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Hour | A | B | C | D | E |
| 1 | 85 | 25 | 141 | 142 | 132 |
| 2 | 81 | 26 | 135 | 138 | 135 |
| 3 | 87 | 28 | 137 | 132 | 128 |
| 4 | 82 | 21 | 130 | 126 | 124 |
| 5 | 88 | 22 | 136 | 129 | 124 |

1. RK

a) Describe in ten or fewer words what the ki values represent in 4th Order RK.

b) Show the code to find x and y over the interval 0 ≤ t ≤ 10 using 4th Order Runge-Kutta.

When t = 0, x = 10, and y = 4.

x' = 2t + ln(x + y)

y' = x - y

1. What is the next step, if any, in each of the following tableaus? If there is a pivot operation next, circle it. If there is a pivot operation next, circle it.

a)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **x** | **y** | **z** | **S1** | **S2** | **S3** |  | **F** | **RHS** |
| 5 | 3 | 2 | 1 | 0 | 0 |  | 0 | 1000 |
| 2 | 2 | 1 | 0 | 1 | 0 |  | 0 | 200 |
| 0 | 5 | 6 | 0 | 0 | 1 |  | 0 | 100 |
| -60 | -50 | -2 | 0 | 0 | 0 |  | 1 | 0 |

b)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **x** | **y** | **z** | **S1** | **S2** | **S3** | **A** | **F** | **RHS** |
| 5 | 4 | 2 | 1 | 0 | 0 | 0 | 0 | 1000 |
| 2 | 10 | 1 | 0 | 1 | 0 | 0 | 0 | 200 |
| 0 | 2 | 6 | 0 | 0 | -1 | 1 | 0 | 100 |
| -40 | -50 | -2 | 0 | 0 | 0 | M | 1 | 0 |

c)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **x** | **y** | **z** | **S1** | **S2** | **S3** | **A** | **F** | **RHS** |
| 0 | 3 | 0 | 1 | 4 | 3 | 2 | 0 | 280 |
| 0 | 2 | 1 | 0 | 1 | 0 | -5 | 0 | 52 |
| 1 | 5 | 0 | 0 | 0 | 1 | 3 | 0 | 21 |
| 0 | 50 | 0 | 0 | 35 | 5 | 14 | 1 | 4560 |

5. Given the following data

|  |  |  |  |
| --- | --- | --- | --- |
| x | f(x) |  |  |
| 1 | 2.20 |  |  |
| 1.2 | 2.91 |  |  |
| 1.6 | 4.28 |  |  |
| 2.2 | 6.57 |  |  |
| 3.1 | 11.47 |  |  |
| 6.3 | 57.72 |  |  |
| 5.4 | 38.72 |  |  |
|  |  |  |  |

that fits the equation 

describe the mathematical basis for finding the best values for the coefficients a, b, and c.

You may write in columns 3 and 4. There is no need to write repetitive equations once the idea is written twice. Use “ditto”.

1. What is the basic feasible solution (values of x, y, z, S1, S2, S3, F) for
2. tableau a) in problem 4)?

b) How many evaluations would be required in a Fibonacci search of a Unimodal function to reduce the interval of uncertainty by 55?

c) Cite a MATLAB function that could be used to solve problem 5).

Scratch paper - discard