Advanced Numerical Techniques

Assignment - 5

Question 1

Solve by Quasi-Linearization

$f'' + ff' + 1 - (f')^2 = 0$

$f(0) = 0,\ f'(0) = 0,\ f'(10) = 1$

Solution:

w =

Columns 1 through 9

0 0.0275 0.1061 0.2285 0.3874 0.5763 0.7890 1.0199 1.2643

0 0.2749 0.5115 0.7117 0.8776 1.0113 1.1157 1.1939 1.2497

Columns 10 through 18

1.5180 1.7777 2.0408 2.3055 2.5705 2.8349 3.0981 3.3599 3.6200

1.2871 1.3098 1.3216 1.3256 1.3243 1.3196 1.3128 1.3047 1.2960

Columns 19 through 27

3.8783 4.1348 4.3894 4.6422 4.8931 5.1422 5.3894 5.6348 5.8783

1.2870 1.2779 1.2686 1.2593 1.2500 1.2407 1.2314 1.2221 1.2128

Columns 28 through 36

6.1199 6.3597 6.5976 6.8337 7.0679 7.3003 7.5308 7.7594 7.9862

1.2036 1.1943 1.1850 1.1757 1.1664 1.1572 1.1479 1.1386 1.1293
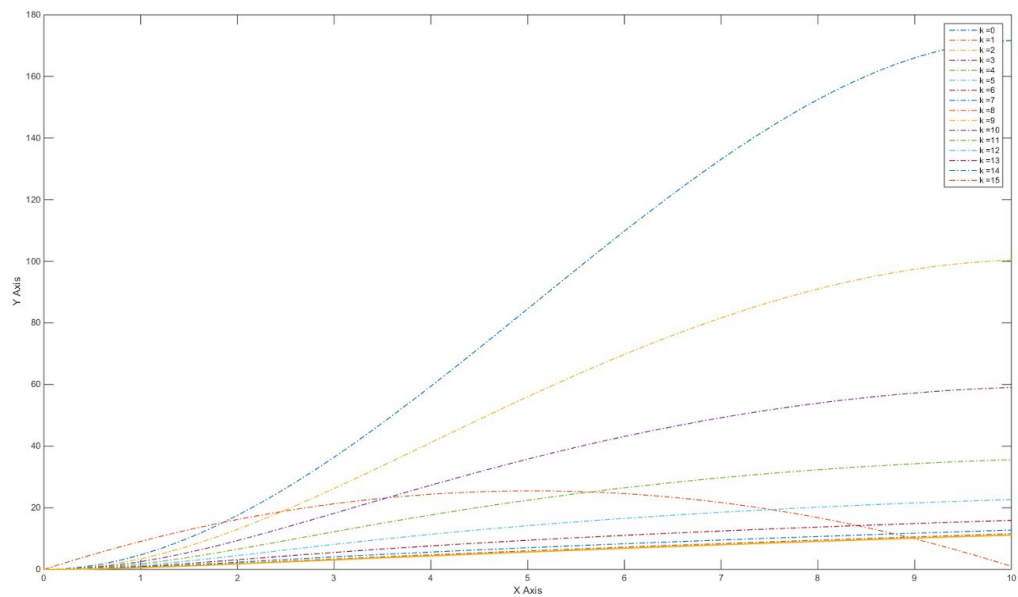
Columns 37 through 45

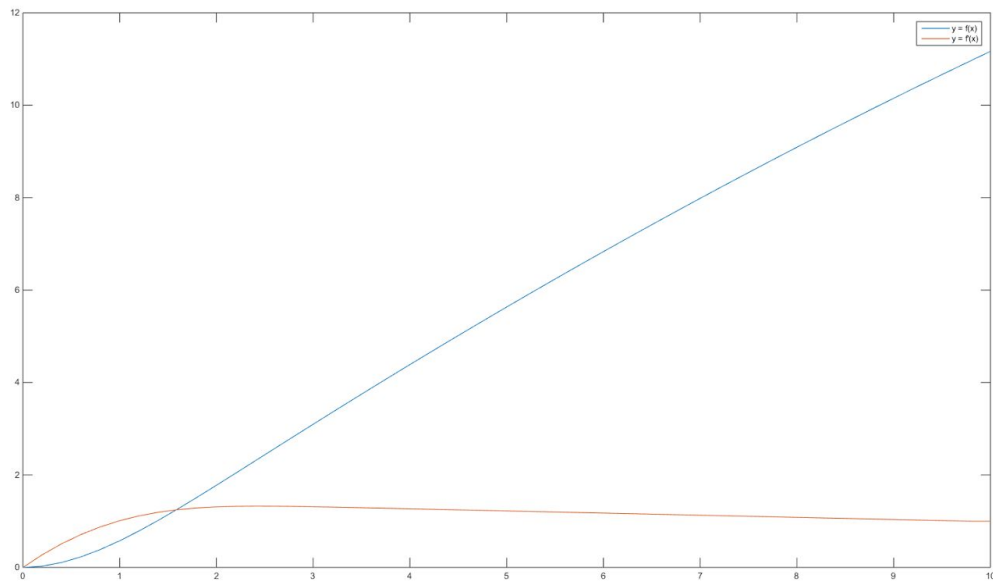8.2112 8.4342 8.6555 8.8749 9.0924 9.3080 9.5219 9.7338 9.9439

1.1201 1.1108 1.1015 1.0923 1.0830 1.0737 1.0645 1.0552 1.0459

Columns 46 through 51

10.1522 10.3586 10.5632 10.7659 10.9668 11.1670

1.0367 1.0274 1.0182 1.0089 0.9997 1.0000

Question 2

Solve del(u)/del(t) = del^2(u)/del(x^2),

$0 < x < 1, t >= 0$

Initial Condition: $u(x, 0) = sin(PI * x)$

Boundary Condition: $u(0, t) = u(1, t) = 0$

Use del(x) = 0.01, for different del(t), solve by implicit scheme

Solution:

ans =

0	0.7071	1.0000	0.7071	0
0	0.6465	0.9143	0.6465	0
0	0.5911	0.8360	0.5911	0
0	0.5405	0.7643	0.5405	0

Temperature within the lasson (implicit) method

Temperature within the implicit method