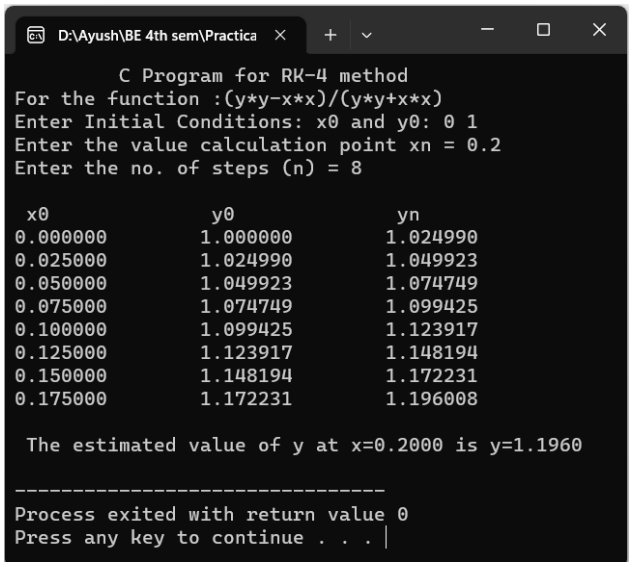
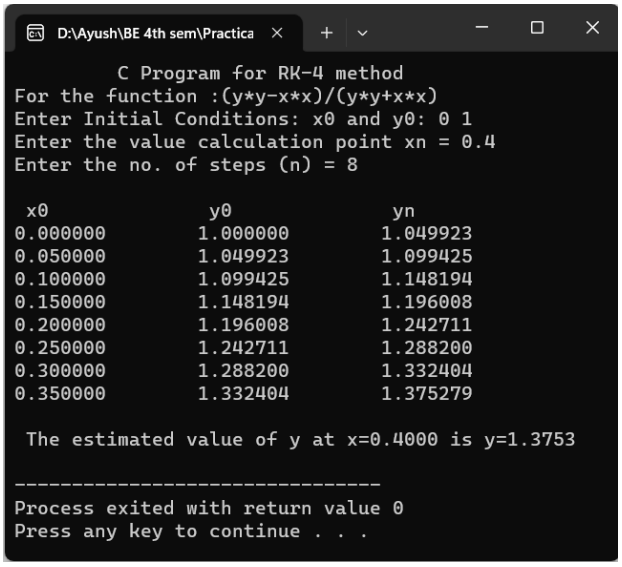
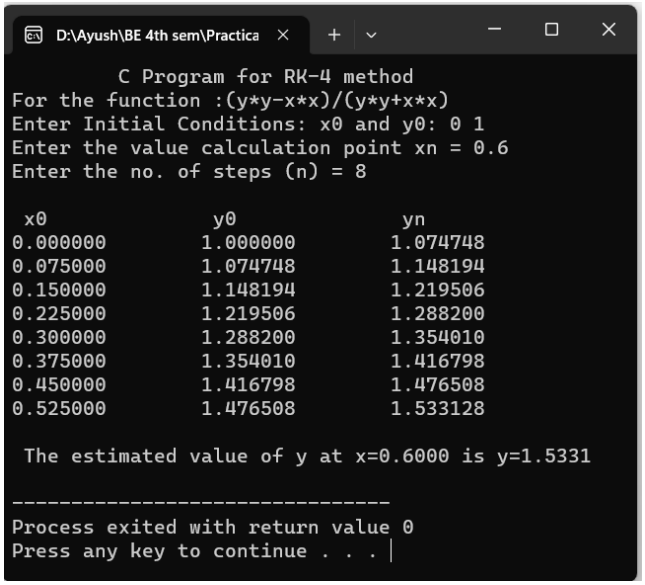
Using RK-4 method, solve:

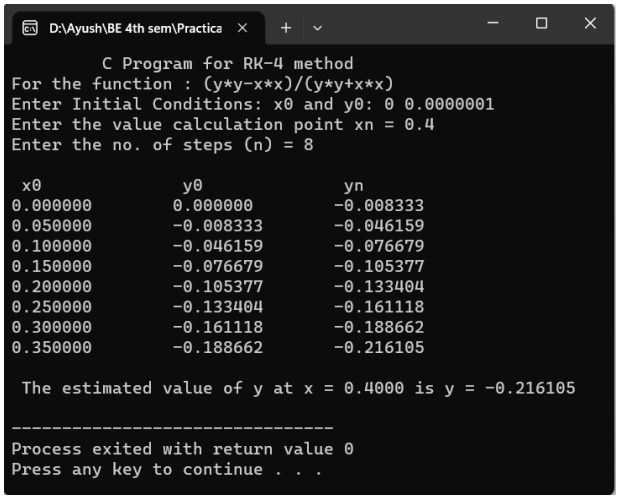
a) $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ and y(0)=1 at x = 0.2, 0.4, 0.6







b) $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ and y(0)=0 at x = 0.4, 0.8



```
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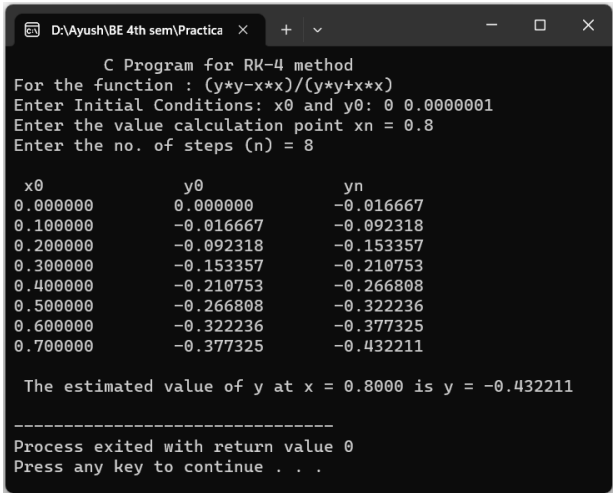
        C Program for RK-4 method
For the function : (y*y-x*x)/(y*y+x*x)
Enter Initial Conditions: x0 and y0: 0 0.0000001
Enter the value calculation point xn = 0.4
Enter the no. of steps (n) = 8

 x0              y0              yn
0.000000        0.000000        -0.008333
0.050000        -0.008333       -0.046159
0.100000        -0.046159       -0.076679
0.150000        -0.076679       -0.105377
0.200000        -0.105377       -0.133404
0.250000        -0.133404       -0.161118
0.300000        -0.161118       -0.188662
0.350000        -0.188662       -0.216105

 The estimated value of y at x = 0.4000 is y = -0.216105

--------------------------------
Process exited with return value 0
Press any key to continue . . .
```



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        C Program for RK-4 method
For the function : (y*y-x*x)/(y*y+x*x)
Enter Initial Conditions: x0 and y0: 0 0.0000001
Enter the value calculation point xn = 0.8
Enter the no. of steps (n) = 8

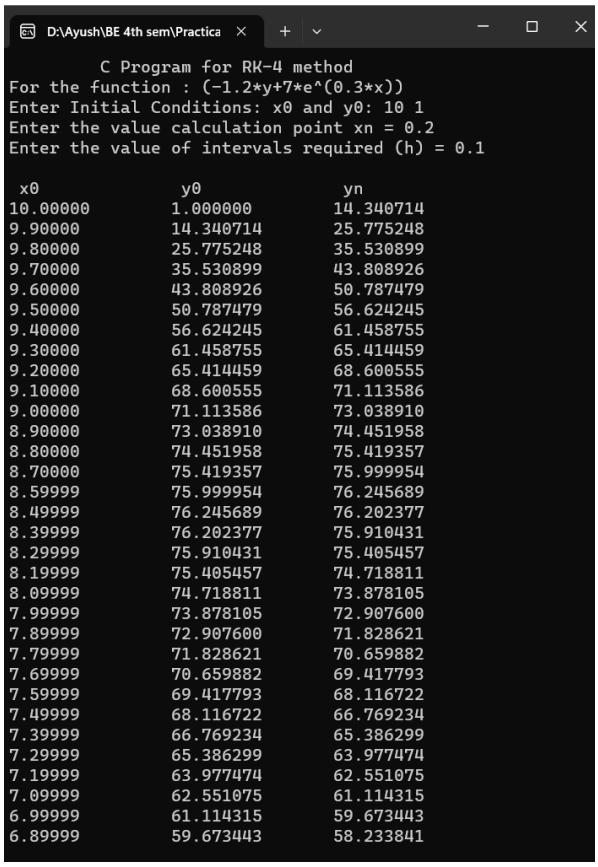
 x0              y0              yn
0.000000        0.000000        -0.016667
0.100000        -0.016667       -0.092318
0.200000        -0.092318       -0.153357
0.300000        -0.153357       -0.210753
0.400000        -0.210753       -0.266808
0.500000        -0.266808       -0.322236
0.600000        -0.322236       -0.377325
0.700000        -0.377325       -0.432211

 The estimated value of y at x = 0.8000 is y = -0.432211

--------------------------------
Process exited with return value 0
Press any key to continue . . .
```

c) $\frac{dy}{dx} = -1.2y + 7e^{0.3x}$ and y(10)=1 at x = 0.2, 0.4, 0.6

(i) At x = 0.2



```
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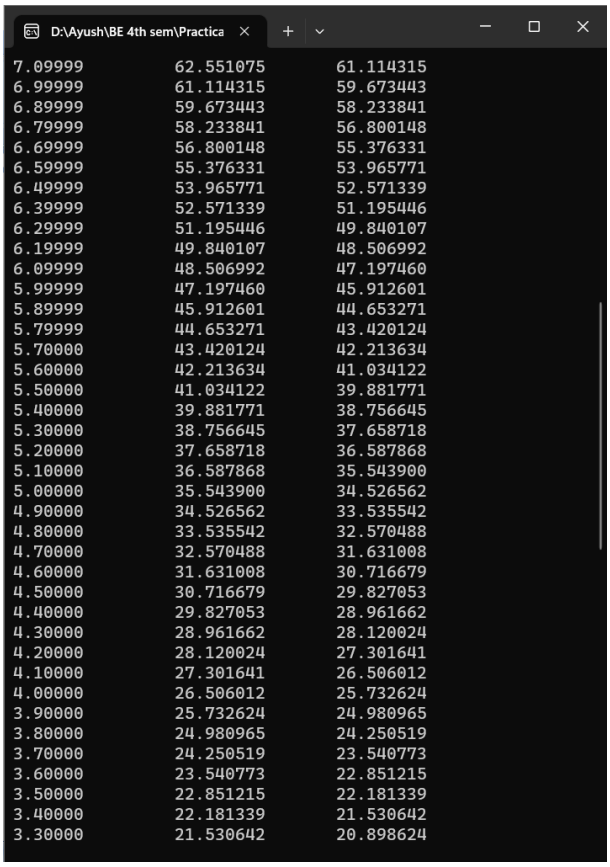
        C Program for RK-4 method
For the function : (-1.2*y+7*e^(0.3*x))
Enter Initial Conditions: x0 and y0: 10 1
Enter the value calculation point xn = 0.2
Enter the value of intervals required (h) = 0.1

 x0              y0              yn
10.00000        1.000000        14.340714
9.90000         14.340714       25.775248
9.80000         25.775248       35.530899
9.70000         35.530899       43.808926
9.60000         43.808926       50.787479
9.50000         50.787479       56.624245
9.40000         56.624245       61.458755
9.30000         61.458755       65.414459
9.20000         65.414459       68.600555
9.10000         68.600555       71.113586
9.00000         71.113586       73.038910
8.90000         73.038910       74.451958
8.80000         74.451958       75.419357
8.70000         75.419357       75.999954
8.59999         75.999954       76.245689
8.49999         76.245689       76.202377
8.39999         76.202377       75.910431
8.29999         75.910431       75.405457
8.19999         75.405457       74.718811
8.09999         74.718811       73.878105
7.99999         73.878105       72.907600
7.89999         72.907600       71.828621
7.79999         71.828621       70.659882
7.69999         70.659882       69.417793
7.59999         69.417793       68.116722
7.49999         68.116722       66.769234
7.39999         66.769234       65.386299
7.29999         65.386299       63.977474
7.19999         63.977474       62.551075
7.09999         62.551075       61.114315
6.99999         61.114315       59.673443
6.89999         59.673443       58.233841
```



```
D:\Ayush\BE 4th sem\Practica

7.09999         62.551075       61.114315
6.99999         61.114315       59.673443
6.89999         59.673443       58.233841
6.79999         58.233841       56.800148
6.69999         56.800148       55.376331
6.59999         55.376331       53.965771
6.49999         53.965771       52.571339
6.39999         52.571339       51.195446
6.29999         51.195446       49.840107
6.19999         49.840107       48.506992
6.09999         48.506992       47.197460
5.99999         47.197460       45.912601
5.89999         45.912601       44.653271
5.79999         44.653271       43.420124
5.70000         43.420124       42.213634
5.60000         42.213634       41.034122
5.50000         41.034122       39.881771
5.40000         39.881771       38.756645
5.30000         38.756645       37.658718
5.20000         37.658718       36.587868
5.10000         36.587868       35.543900
5.00000         35.543900       34.526562
4.90000         34.526562       33.535542
4.80000         33.535542       32.570488
4.70000         32.570488       31.631008
4.60000         31.631008       30.716679
4.50000         30.716679       29.827053
4.40000         29.827053       28.961662
4.30000         28.961662       28.120024
4.20000         28.120024       27.301641
4.10000         27.301641       26.506012
4.00000         26.506012       25.732624
3.90000         25.732624       24.980965
3.80000         24.980965       24.250519
3.70000         24.250519       23.540773
3.60000         23.540773       22.851215
3.50000         22.851215       22.181339
3.40000         22.181339       21.530642
3.30000         21.530642       20.898624
```

```
D:\Ayush\BE 4th sem\Practica
3.50000         22.851215       22.181339
3.40000         22.181339       21.530642
3.30000         21.530642       20.898624
3.20000         20.898624       20.284800
3.10000         20.284800       19.688684
3.00000         19.688684       19.109802
2.90000         19.109802       18.547689
2.80000         18.547689       18.001888
2.70000         18.001888       17.471951
2.60000         17.471951       16.957438
2.50000         16.957438       16.457920
2.40000         16.457920       15.972979
2.30000         15.972979       15.502204
2.20000         15.502204       15.045197
2.10000         15.045197       14.601565
2.00000         14.601565       14.170930
1.90000         14.170930       13.752919
1.80000         13.752919       13.347172
1.70000         13.347172       12.953335
1.60000         12.953335       12.571066
1.50000         12.571066       12.200032
1.40000         12.200032       11.839908
1.30000         11.839908       11.490376
1.20000         11.490376       11.151132
1.10000         11.151132       10.821874
1.00000         10.821874       10.502312
0.90000         10.502312       10.192163
0.80000         10.192163       9.891154
0.70000         9.891154        9.599017
0.60000         9.599017        9.315492
0.50000         9.315492        9.040327
0.40000         9.040327        8.773277
0.30000         8.773277        8.514106

 The estimated value of y at x = 0.2000 is y = 8.514106

--------------------------------
Process exited with return value 0
Press any key to continue . . .
```

(ii) At x = 0.4

```
D:\Ayush\BE 4th sem\Practica
        C Program for RK-4 method
For the function : (-1.2*y+7*e^(0.3*x))
Enter Initial Conditions: x0 and y0: 10 1
Enter the value calculation point xn = 0.4
Enter the value of intervals required (h) = 0.1

 x0              y0              yn
10.00000        1.000000        14.340714
9.90000         14.340714       25.775248
9.80000         25.775248       35.530899
9.70000         35.530899       43.808926
9.60000         43.808926       50.787479
9.50000         50.787479       56.624245
9.40000         56.624245       61.458755
9.30000         61.458755       65.414459
9.20000         65.414459       68.600555
9.10000         68.600555       71.113586
9.00000         71.113586       73.038910
8.90000         73.038910       74.451958
8.80000         74.451958       75.419357
8.70000         75.419357       75.999954
8.59999         75.999954       76.245689
8.49999         76.245689       76.202377
8.39999         76.202377       75.910431
8.29999         75.910431       75.405457
8.19999         75.405457       74.718811
8.09999         74.718811       73.878105
7.99999         73.878105       72.907600
7.89999         72.907600       71.828621
7.79999         71.828621       70.659882
7.69999         70.659882       69.417793
7.59999         69.417793       68.116722
7.49999         68.116722       66.769234
7.39999         66.769234       65.386299
7.29999         65.386299       63.977474
7.19999         63.977474       62.551075
7.09999         62.551075       61.114315
6.99999         61.114315       59.673443
6.89999         59.673443       58.233841
```

```
D:\Ayush\BE 4th sem\Practica
7.09999         62.551075       61.114315
6.99999         61.114315       59.673443
6.89999         59.673443       58.233841
6.79999         58.233841       56.800148
6.69999         56.800148       55.376331
6.59999         55.376331       53.965771
6.49999         53.965771       52.571339
6.39999         52.571339       51.195446
6.29999         51.195446       49.840107
6.19999         49.840107       48.506992
6.09999         48.506992       47.197460
5.99999         47.197460       45.912601
5.89999         45.912601       44.653271
5.79999         44.653271       43.420124
5.70000         43.420124       42.213634
5.60000         42.213634       41.034122
5.50000         41.034122       39.881771
5.40000         39.881771       38.756645
5.30000         38.756645       37.658718
5.20000         37.658718       36.587868
5.10000         36.587868       35.543900
5.00000         35.543900       34.526562
4.90000         34.526562       33.535542
4.80000         33.535542       32.570488
4.70000         32.570488       31.631008
4.60000         31.631008       30.716679
4.50000         30.716679       29.827053
4.40000         29.827053       28.961662
4.30000         28.961662       28.120024
4.20000         28.120024       27.301641
4.10000         27.301641       26.506012
4.00000         26.506012       25.732624
3.90000         25.732624       24.980965
3.80000         24.980965       24.250519
3.70000         24.250519       23.540773
3.60000         23.540773       22.851215
3.50000         22.851215       22.181339
3.40000         22.181339       21.530642
3.30000         21.530642       20.898624
```

```
3.60000         23.540773       22.851215
3.50000         22.851215       22.181339
3.40000         22.181339       21.530642
3.30000         21.530642       20.898624
3.20000         20.898624       20.284800
3.10000         20.284800       19.688684
3.00000         19.688684       19.109802
2.90000         19.109802       18.547689
2.80000         18.547689       18.001888
2.70000         18.001888       17.471951
2.60000         17.471951       16.957438
2.50000         16.957438       16.457920
2.40000         16.457920       15.972979
2.30000         15.972979       15.502204
2.20000         15.502204       15.045197
2.10000         15.045197       14.601565
2.00000         14.601565       14.170930
1.90000         14.170930       13.752919
1.80000         13.752919       13.347172
1.70000         13.347172       12.953335
1.60000         12.953335       12.571066
1.50000         12.571066       12.200032
1.40000         12.200032       11.839908
1.30000         11.839908       11.490376
1.20000         11.490376       11.151132
1.10000         11.151132       10.821874
1.00000         10.821874       10.502312
0.90000         10.502312       10.192163
0.80000         10.192163       9.891154
0.70000         9.891154        9.599017
0.60000         9.599017        9.315492
0.50000         9.315492        9.040327

 The estimated value of y at x = 0.4000 is y = 9.040327

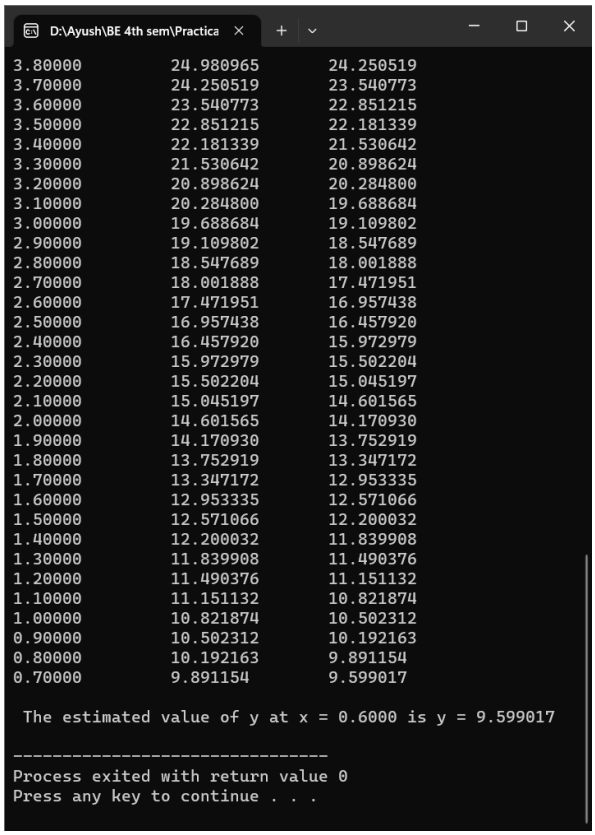
--------------------------------
Process exited with return value 0
Press any key to continue . . .
```

(iii) At x = 0.6

```
        C Program for RK-4 method
For the function : (-1.2*y+7*e^(0.3*x))
Enter Initial Conditions: x0 and y0: 10 1
Enter the value calculation point xn = 0.6
Enter the value of intervals required (h) = 0.1

 x0              y0              yn
10.00000        1.000000        14.340714
9.90000         14.340714       25.775248
9.80000         25.775248       35.530899
9.70000         35.530899       43.808926
9.60000         43.808926       50.787479
9.50000         50.787479       56.624245
9.40000         56.624245       61.458755
9.30000         61.458755       65.414459
9.20000         65.414459       68.600555
9.10000         68.600555       71.113586
9.00000         71.113586       73.038910
8.90000         73.038910       74.451958
8.80000         74.451958       75.419357
8.70000         75.419357       75.999954
8.59999         75.999954       76.245689
8.49999         76.245689       76.202377
8.39999         76.202377       75.910431
8.29999         75.910431       75.405457
8.19999         75.405457       74.718811
8.09999         74.718811       73.878105
7.99999         73.878105       72.907600
7.89999         72.907600       71.828621
7.79999         71.828621       70.659882
7.69999         70.659882       69.417793
7.59999         69.417793       68.116722
7.49999         68.116722       66.769234
7.39999         66.769234       65.386299
7.29999         65.386299       63.977474
7.19999         63.977474       62.551075
7.09999         62.551075       61.114315
6.99999         61.114315       59.673443
6.89999         59.673443       58.233841
```

```
7.09999         62.551075       61.114315
6.99999         61.114315       59.673443
6.89999         59.673443       58.233841
6.79999         58.233841       56.800148
6.69999         56.800148       55.376331
6.59999         55.376331       53.965771
6.49999         53.965771       52.571339
6.39999         52.571339       51.195446
6.29999         51.195446       49.840107
6.19999         49.840107       48.506992
6.09999         48.506992       47.197460
5.99999         47.197460       45.912601
5.89999         45.912601       44.653271
5.79999         44.653271       43.420124
5.70000         43.420124       42.213634
5.60000         42.213634       41.034122
5.50000         41.034122       39.881771
5.40000         39.881771       38.756645
5.30000         38.756645       37.658718
5.20000         37.658718       36.587868
5.10000         36.587868       35.543900
5.00000         35.543900       34.526562
4.90000         34.526562       33.535542
4.80000         33.535542       32.570488
4.70000         32.570488       31.631008
4.60000         31.631008       30.716679
4.50000         30.716679       29.827053
4.40000         29.827053       28.961662
4.30000         28.961662       28.120024
4.20000         28.120024       27.301641
4.10000         27.301641       26.506012
4.00000         26.506012       25.732624
3.90000         25.732624       24.980965
3.80000         24.980965       24.250519
3.70000         24.250519       23.540773
3.60000         23.540773       22.851215
3.50000         22.851215       22.181339
3.40000         22.181339       21.530642
3.30000         21.530642       20.898624
```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3.80000 24.980965 24.250519
3.70000 24.250519 23.540773
3.60000 23.540773 22.851215
3.50000 22.851215 22.181339
3.40000 22.181339 21.530642
3.30000 21.530642 20.898624
3.20000 20.898624 20.284800
3.10000 20.284800 19.688684
3.00000 19.688684 19.109802
2.90000 19.109802 18.547689
2.80000 18.547689 18.001888
2.70000 18.001888 17.471951
2.60000 17.471951 16.957438
2.50000 16.957438 16.457920
2.40000 16.457920 15.972979
2.30000 15.972979 15.502204
2.20000 15.502204 15.045197
2.10000 15.045197 14.601565
2.00000 14.601565 14.170930
1.90000 14.170930 13.752919
1.80000 13.752919 13.347172
1.70000 13.347172 12.953335
1.60000 12.953335 12.571066
1.50000 12.571066 12.200032
1.40000 12.200032 11.839908
1.30000 11.839908 11.490376
1.20000 11.490376 11.151132
1.10000 11.151132 10.821874
1.00000 10.821874 10.502312
0.90000 10.502312 10.192163
0.80000 10.192163 9.891154
0.70000 9.891154 9.599017
The estimated value of y at x = 0.6000 is y = 9.599017
Process exited with return value 0
Press any key to continue . . .