

Using RK-4 method, solve:

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

```
C Program for RK-4 method
For the function :(y*y-x*x)/(y*y+x*x)
Enter Initial Conditions: x0 and y0: 0 1
Enter the value calculation point xn = 0.2
Enter the no. of steps (n) = 8

x0      y0      yn
0.000000 1.000000 1.024990
0.025000 1.024990 1.049923
0.050000 1.049923 1.074749
0.075000 1.074749 1.099425
0.100000 1.099425 1.123917
0.125000 1.123917 1.148194
0.150000 1.148194 1.172231
0.175000 1.172231 1.196008

The estimated value of y at x=0.2000 is y=1.1960

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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 1
Enter the value calculation point xn = 0.4
Enter the no. of steps (n) = 8

x0      y0      yn
0.000000 1.000000 1.049923
0.050000 1.049923 1.099425
0.100000 1.099425 1.148194
0.150000 1.148194 1.196008
0.200000 1.196008 1.242711
0.250000 1.242711 1.288200
0.300000 1.288200 1.332404
0.350000 1.332404 1.375279

The estimated value of y at x=0.4000 is y=1.3753

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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 1
Enter the value calculation point xn = 0.6
Enter the no. of steps (n) = 8

x0      y0      yn
0.000000 1.000000 1.074748
0.075000 1.074748 1.148194
0.150000 1.148194 1.219506
0.225000 1.219506 1.288200
0.300000 1.288200 1.354010
0.375000 1.354010 1.416798
0.450000 1.416798 1.476508
0.525000 1.476508 1.533128

The estimated value of y at x=0.6000 is y=1.5331

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Process exited with return value 0
Press any key to continue . . . |
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b) $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ and $y(0)=0$ at $x = 0.4, 0.8$

```
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

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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

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Process exited with return value 0
Press any key to continue . . .
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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
8.60000 75.999954 76.245689
8.50000 76.245689 76.202377
8.40000 76.202377 75.910431
8.30000 75.910431 75.405457
8.20000 75.405457 74.718811
8.10000 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
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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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D:\Ayush\BE 4th sem\Practica x + - □ X
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

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Process exited with return value 0
Press any key to continue . . .
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(ii) At x = 0.4

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D:\Ayush\BE 4th sem\Practica x + - □ X
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
8.60000  75.999954  76.245689
8.50000  76.245689  76.202377
8.40000  76.202377  75.910431
8.30000  75.910431  75.405457
8.20000  75.405457  74.718811
8.10000  74.718811  73.878105
8.00000  73.878105  72.907600
7.90000  72.907600  71.828621
7.80000  71.828621  70.659882
7.70000  70.659882  69.417793
7.60000  69.417793  68.116722
7.50000  68.116722  66.769234
7.40000  66.769234  65.386299
7.30000  65.386299  63.977474
7.20000  63.977474  62.551075
7.10000  62.551075  61.114315
7.00000  61.114315  59.673443
6.90000  59.673443  58.233841
6.80000  58.233841  56.800148
6.70000  56.800148  55.376331
6.60000  55.376331  53.965771
6.50000  53.965771  52.571339
6.40000  52.571339  51.195446
6.30000  51.195446  49.840107
6.20000  49.840107  48.506992
6.10000  48.506992  47.197460
6.00000  47.197460  45.912601
5.90000  45.912601  44.653271
5.80000  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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D:\Ayush\BE 4th sem\Practica x + - □ ×
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

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

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(iii) At $x = 0.6$

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D:\Ayush\BE 4th sem\Practica x + - □ ×
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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D:\Ayush\BE 4th sem\Practica x + - □ x
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

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