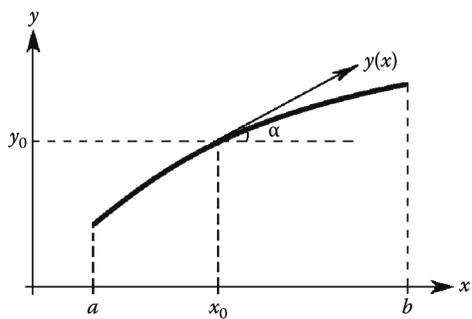


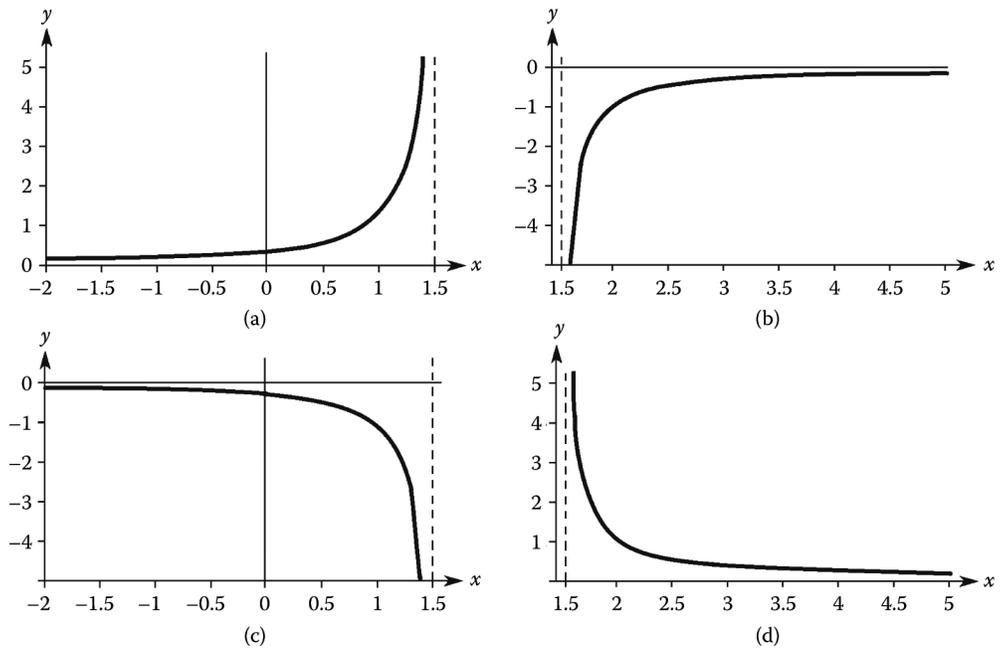
**FIGURE 2.1**

Solution to the Cauchy problem (2.3), (2.4).



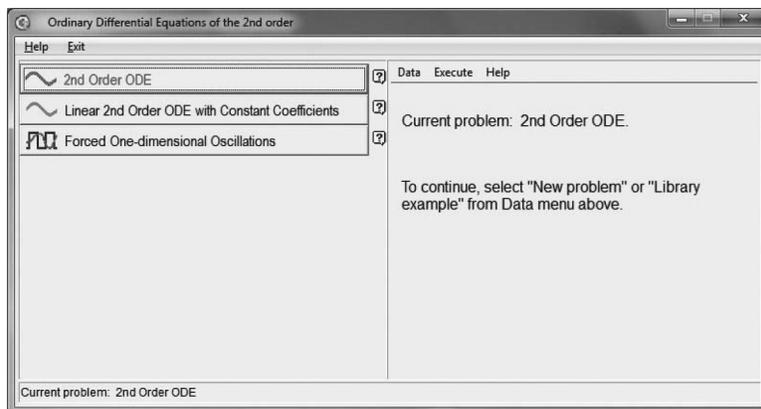
**FIGURE 2.2**

Four particular solutions for different initial conditions. Dashed line is the vertical asymptote  $x = -C_2/C_1 = 1.5$ .



**FIGURE 2.3**

Starting interface of the program **ODE 2nd order**.



**FIGURE 2.4**

Equation  $yy'' - 2y^2 = 0$  with initial conditions  $y(1) = -1$ ,  $y'(1) = 2$ .

Enter Parameters of the Problem

**Differential Equation:**  $y'' = f(x, y, y')$

Right-hand Side of Equation (use letter  $s$  for  $y'$ ):

$f(x, y, y') = 2*s^2/y$

**Initial Conditions**

$x_0 = 1$

$y(x_0) = -1$

$y'(x_0) = 2$

**Interval Limits for Solution**

$x_{min} = 1$

$x_{max} = 3$

**Type of Output**

Graph of the IVP Solution

Table of the IVP Solution

Number of Steps for the Table  
( $0 < M \leq 1000$ ):

$M =$

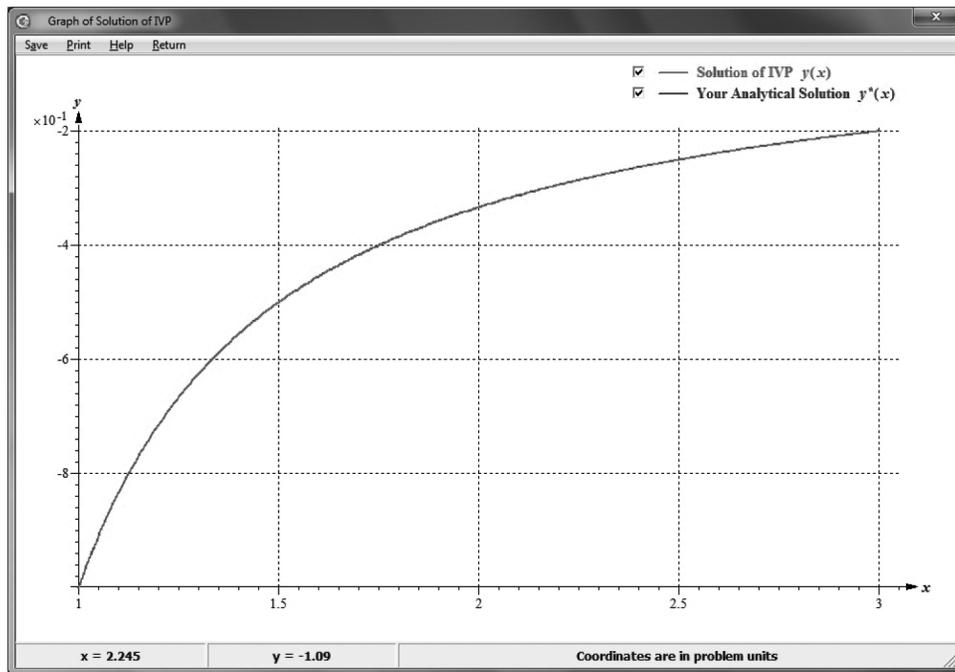
**Your Analytical Solution:**

$y^*(x) = 1/(1 - 2*x)$

OK Cancel Help

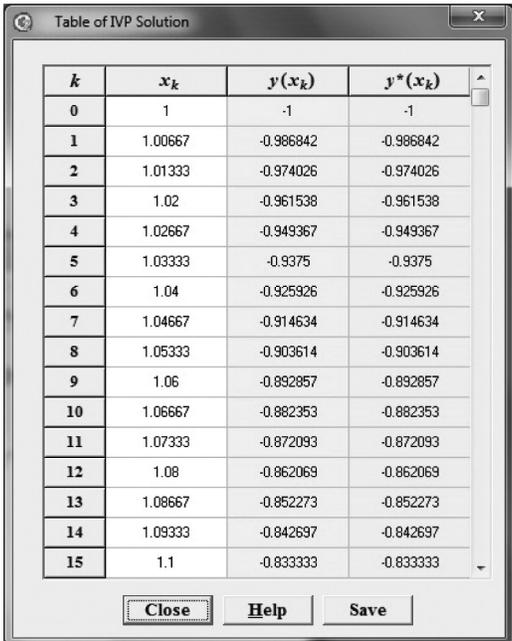
**FIGURE 2.5**

Graph of the solution of equation  $yy'' - 2y'^2 = 0$  with initial conditions  $y(1) = -1$ ,  $y'(1) = 2$ .



**FIGURE 2.6**

Solution of equation  $yy'' - 2y^2 = 0$  with initial conditions  $y(1) = -1$ ,  $y'(1) = 2$  presented in the table form.



The screenshot shows a window titled "Table of IVP Solution" with a close button in the top right corner. The window contains a table with four columns:  $k$ ,  $x_k$ ,  $y(x_k)$ , and  $y'(x_k)$ . The table lists values for  $k$  from 0 to 15. At the bottom of the window, there are three buttons: "Close", "Help", and "Save".

$k$	$x_k$	$y(x_k)$	$y'(x_k)$
0	1	-1	-1
1	1.00667	-0.986842	-0.986842
2	1.01333	-0.974026	-0.974026
3	1.02	-0.961538	-0.961538
4	1.02667	-0.949367	-0.949367
5	1.03333	-0.9375	-0.9375
6	1.04	-0.925926	-0.925926
7	1.04667	-0.914634	-0.914634
8	1.05333	-0.903614	-0.903614
9	1.06	-0.892857	-0.892857
10	1.06667	-0.882353	-0.882353
11	1.07333	-0.872093	-0.872093
12	1.08	-0.862069	-0.862069
13	1.08667	-0.852273	-0.852273
14	1.09333	-0.842697	-0.842697
15	1.1	-0.833333	-0.833333

**FIGURE 2.7**

Equation  $y'' + y = \sin x + x$  with initial conditions  $y(0) = 1, y'(0) = 0$ .

Enter Parameters of the Problem

**Differential Equation:**  $y'' + py' + qy = f(x)$

Right-hand Side of Equation:  
 $f(x) = \sin(x) + x$

**Parameters of the Equation:**  
 $p = 0$   
 $q = 1$

**Initial Conditions:**  
 $x_0 = 0$   
 $y(x_0) = 1$   
 $y'(x_0) = 0$

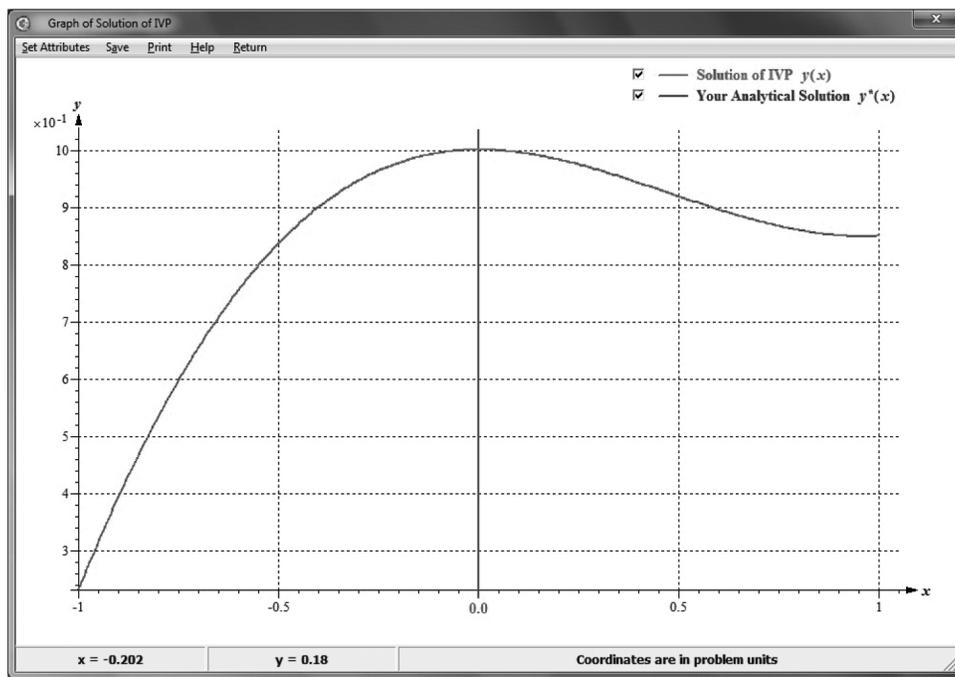
**Interval Limits for Solution:**  
 $x_{min} = -1$   
 $x_{max} = 1$

Your Analytical Solution:  
 $y^*(x) = (1-0.5*x)^2*cos(x) - 0.5*sin(x) + x$

OK Cancel Help

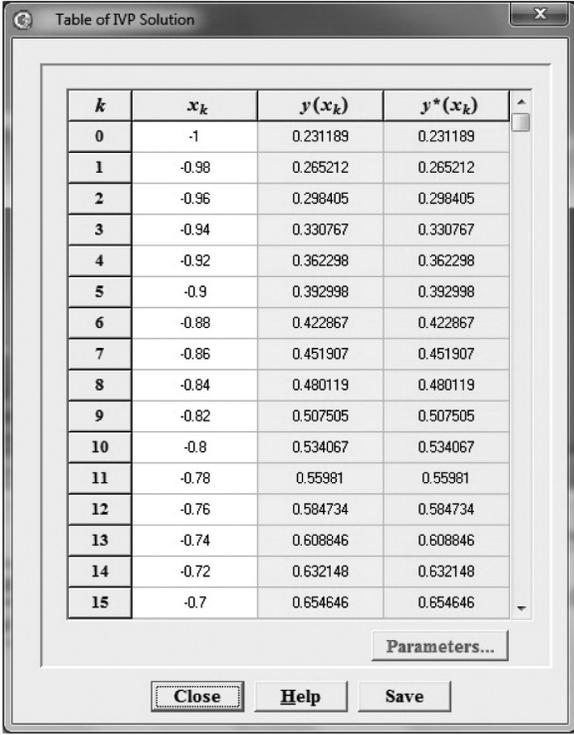
**FIGURE 2.8**

Example 2.25. IVP solution: analytical and numerical.



**FIGURE 2.9**

Example 2.25. Solution of IVP presented in the table form.



$k$	$x_k$	$y(x_k)$	$y^*(x_k)$
0	-1	0.231189	0.231189
1	-0.98	0.265212	0.265212
2	-0.96	0.298405	0.298405
3	-0.94	0.330767	0.330767
4	-0.92	0.362298	0.362298
5	-0.9	0.392998	0.392998
6	-0.88	0.422867	0.422867
7	-0.86	0.451907	0.451907
8	-0.84	0.480119	0.480119
9	-0.82	0.507505	0.507505
10	-0.8	0.534067	0.534067
11	-0.78	0.55981	0.55981
12	-0.76	0.584734	0.584734
13	-0.74	0.608846	0.608846
14	-0.72	0.632148	0.632148
15	-0.7	0.654646	0.654646

FIGURE 2.10

Example 2.25. Graphs of the fundamental solutions of equation  $y'' + y = \sin x + x$ .

