

Chapter 12 / Example 6

The Euler Method

- a** Use the Euler method with a step size of 0.1 to find the approximate values of x and y when $t = 1$ and $t = 2$ for the following system of differential equations:
- $$\dot{x} = 3x - 4y$$
- $$\dot{y} = x - 2y$$
- and $x = 4$ given $y = -2$ when $t = 0$.

Press **MENU** 8 **RECUR** to display the sequence entry screen.

The first equation is $x_{n+1} = 1.3x_n - 0.4y_n$.

To enter this in the fx-CG50 you will need to use a_{n+1} in place of x_{n+1} , a_n in place of x_n and b_n in place of y_n .

Recursion
 $a_{n+1} :$ [—]
 $b_{n+1} :$ [—]
 $c_{n+1} :$ [—]
 SEL+S DELETE TYPE n.an... SET TABLE

Enter $1.3a_n - 0.4b_n$ as the first sequence as a_{n+1} .

To enter a_n , b_n and n press **F4** followed by **F2**, **F3** and **F1**.

Recursion
 $a_{n+1} :$ $1.3a_n - 0.4b_n$ [—]
 $b_{n+1} :$ [—]
 $c_{n+1} :$ [—]
 SEL+S DELETE TYPE n.an... SET TABLE

The second equation is $y_{n+1} = 0.1x_n + 0.8y_n$

Type $0.1a_n + 0.8b_n$ to enter the second sequence.

Recursion
 $a_{n+1} :$ $1.3a_n - 0.4b_n$ [—]
 $b_{n+1} :$ $0.1a_n + 0.8b_n$ [—]
 $c_{n+1} :$ [—]
 SEL+S DELETE TYPE n.an... SET TABLE

The value of t is given by $t_{n+1} = t_n + 0.1$

Type $c_n + 0.1$ to enter the sequence as c_{n+1} .

Recursion
 $a_{n+1} :$ $1.3a_n - 0.4b_n$ [—]
 $b_{n+1} :$ $0.1a_n + 0.8b_n$ [—]
 $c_{n+1} :$ $c_n + 0.1$ [—]
 SEL+S DELETE TYPE n.an... SET TABLE

Press **F5** SET

Press **F1** a_0

Change the setting for End to 30.

Set a_0 to 4, b_0 to -2 and c_0 to 0

Press **EXIT**.

Table Setting n+1
 Start: 0
 End : 30
 a_0 : 4
 b_0 : -2
 c_0 : 0
 a_n Str: 0
 a_0 a_1

Chapter 12 / Example 6

The Euler Method

Press **F6** TABLE.

The GDC displays a table of values of the sequences a_n , b_n and c_n .

$n+1$	a_{n+1}	b_{n+1}	c_{n+1}
0	4	-2	0
1	6	-1.2	0.1
2	8.28	-0.36	0.2
3	10.908	0.54	0.3
			0

FORMULA DELETE PHASE WEB-GPH GPH-CON GPH-PLT

You can scroll down the table using **▼**.

From the table, $t = 1$ when $n = 10$

At $t = 1$, $x = 48.1$, $y = 11.0$

$n+1$	a_{n+1}	b_{n+1}	c_{n+1}
7	26.752	5.2531	0.7
8	32.676	6.8777	0.8
9	39.728	8.7698	0.9
10	48.139	10.988	1
			10

FORMULA DELETE PHASE WEB-GPH GPH-CON GPH-PLT

Scroll down the table using **▼**.

From the table, $t = 2$ when $n = 20$

At $t = 2$, $x = 306$, $y = 76.2$

$n+1$	a_{n+1}	b_{n+1}	c_{n+1}
17	176.82	43.705	1.7
18	212.38	52.646	1.8
19	255.04	63.355	1.9
20	306.21	76.188	2
			20

FORMULA DELETE PHASE WEB-GPH GPH-CON GPH-PLT