QuadraticFunction

Script Documentation

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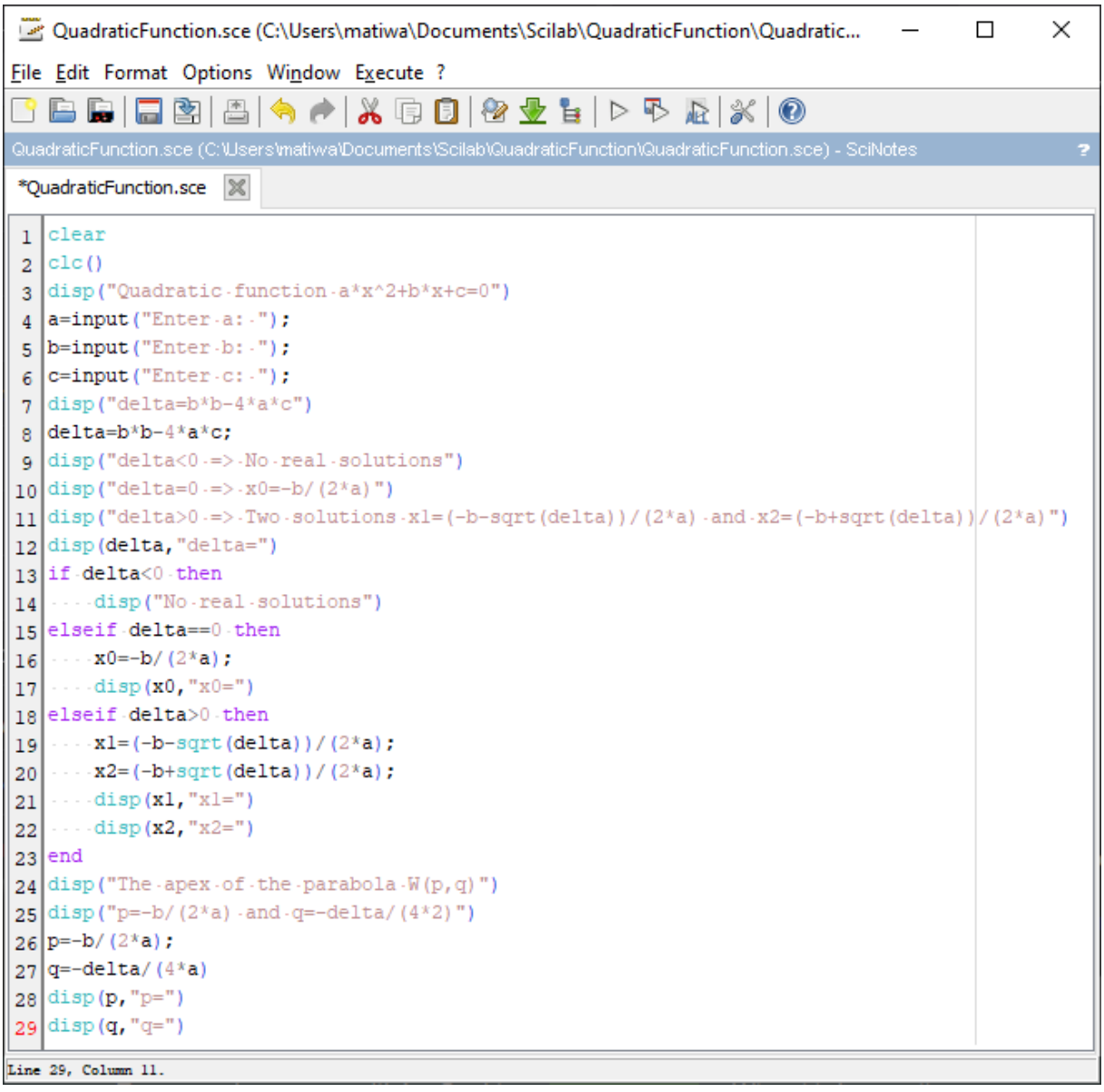
Introduction

This Scilab script file documentation includes: description of the script operation, what is needed for use, used algorithms, description of the source code. This script is used to compute zeros based on the general formula of the quadratic function.

Describing of the script's operation



Drawing 1: Script content [own study]

```
 Quadratic function a*x^2+b*x+c=0
Enter a: 2

Enter b: 0

Enter c: -2


 delta=b*b-4*a*c

 delta<0 => No real solutions

 delta=0 => x0=-b/(2*a)

 delta>0 => Two solutions x1=(-b-sqrt(delta))/(2*a) and x2=(-b+sqrt(delta))/(2*a)

 delta=

   16.

 x1=

  -1.

 x2=

   1.

 The apex of the parabola W(p,q) => p=-b/(2*a) and q=-delta/(4*2)

 p=

   0.
```

Drawing 2: The contents of the Scilab console window $\Delta > 0$ [own study]

```
 q=

  -2.

-->
```

Drawing 3: The contents of the Scilab console window $\Delta > 0$ [own study]

```
 Quadratic function a*x^2+b*x+c=0
Enter a: 2

Enter b: 0

Enter c: 2


 delta=b*b-4*a*c

 delta<0 => No real solutions

 delta=0 => x0=-b/(2*a)

 delta>0 => Two solutions x1=(-b-sqrt(delta))/(2*a) and x2=(-b+sqrt(delta))/(2*a)

 delta=

  -16.

 No real solutions

 The apex of the parabola W(p,q) => p=-b/(2*a) and q=-delta/(4*2)

 p=

   0.

 q=

   2.

--> |
```

Drawing 4: The contents of the Scilab console window $\Delta < 0$ [own study]

```
 Quadratic function a*x^2+b*x+c=0
Enter a: 1

Enter b: 2

Enter c: 1


 delta=b*b-4*a*c

 delta<0 => No real solutions

 delta=0 => x0=-b/(2*a)

 delta>0 => Two solutions x1=(-b-sqrt(delta))/(2*a) and x2=(-b+sqrt(delta))/(2*a)

 delta=

   0.

 x0=

  -1.

 The apex of the parabola W(p,q) => p=-b/(2*a) and q=-delta/(4*2)

 p=

  -1.

 q=

   0.
```

Drawing 5: The contents of the Scilab console window $\Delta = 0$ [own study]

Running a script starts Scilab, then Applications and Scinotes, which is used to edit scripts. Then select on the menu bar, select Execute and Save and Execute (shortcut F5) or Save and Execute all files (shortcut Ctrl + F5).

In order to understand how the script works, it is worth following an example. We have:

a = 2, b = 0, c = -2

$$\Delta=0^2 - 4\cdot2\cdot-2 = 0+16=16$$

There are two zeros because delta is greater than zero.

$$X_1=(-0-\sqrt{16})/(2\cdot2)=-4/4=-1$$

$$X_2=(-0+\sqrt{16})/(2\cdot2)=4/4=1$$

What is needed for use?

The script requires Scilab and a Windows operating system.

Algorithm used

The user enters the variables a, b and c from the general formula of the quadratic function, i.e.:

$$y=ax^2+bx+c$$

From these, Scilab calculates the delta, given by the formula:

$$\Delta=b^2-4\cdot a\cdot c$$

If Δ is less than zero, there are no real solutions. In the case where Δ is equal to zero, it has one solution x_0 of formula:

$$x_0=-b/(2\cdot a)$$

In a situation where the Δ is greater than zero, the function has two solutions with the following formulas:

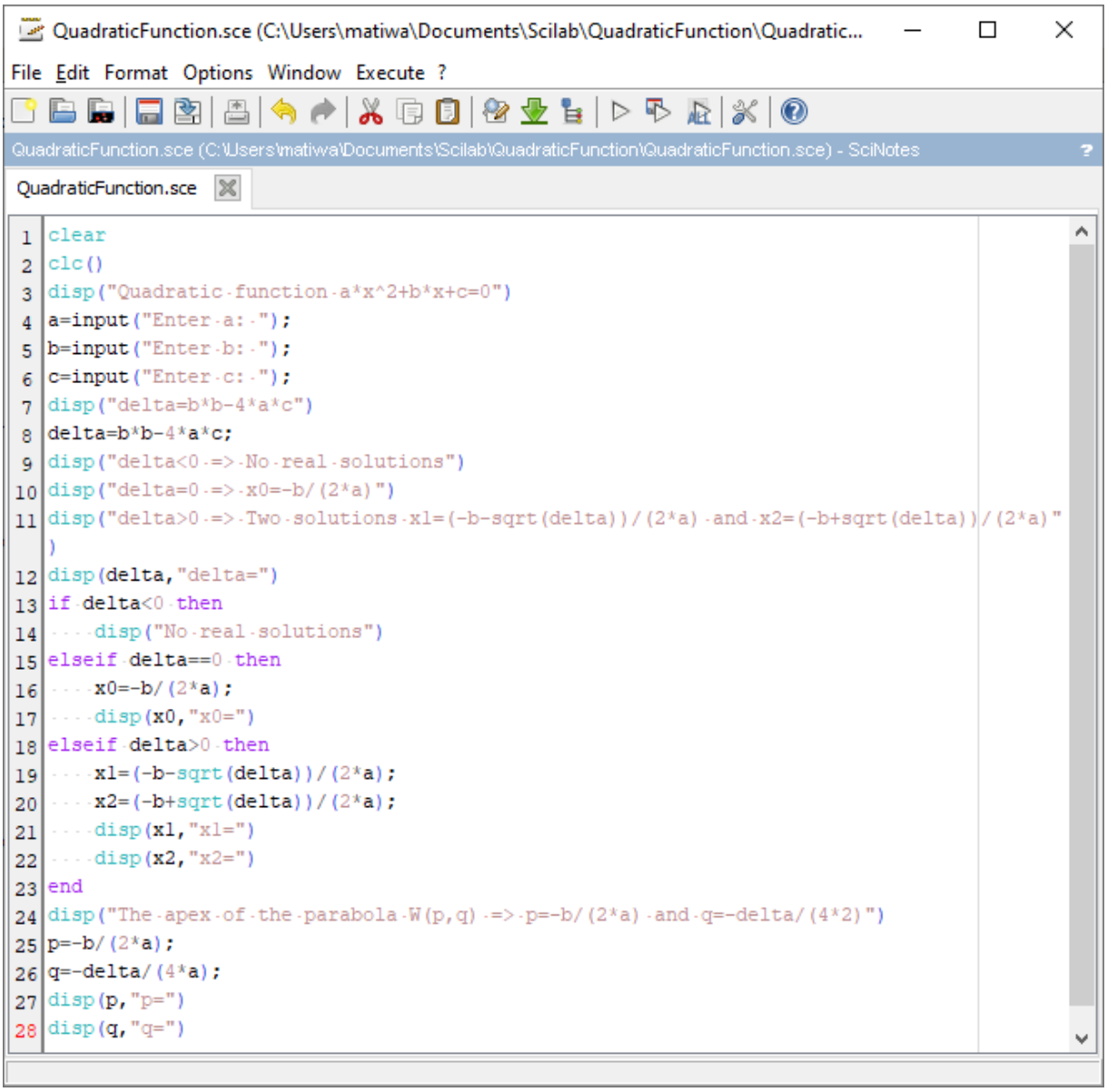
$$x_1=(-b-\sqrt{\Delta}) / (2\cdot a) \qquad and \quad x_2=(-b+\sqrt{\Delta}) / (2\cdot a)$$

The program also determines the coordinates of the parabola W (p, q) with the following formulas:

$$p=-b / (2\cdot a) \qquad and \quad q=-\Delta / (4\cdot a)$$

Interface description

Running the code requires Scilab.



Drawing 6: Scilab graphical interface [own study]

Source code description

The script was made in the Scilab script language, in the Scilab 6.0.2 programming environment. All work was done on the Windows 10 operating system. The script's source code looks like this.

```
clear
clc()
disp("Quadratic function a*x^2+b*x+c=0")
a=input("Enter a: ");
b=input("Enter b: ");
c=input("Enter c: ");
disp("delta=b*b-4*a*c")
delta=b*b-4*a*c;
disp("delta<0 => No real solutions")
disp("delta=0 => x0=-b/(2*a)")
disp("delta>0 => Two solutions x1=(-b-sqrt(delta))/(2*a) and x2=(-b+sqrt(delta))/(2*a)")
```

```
disp(delta,"delta=")
if delta<0 then
   disp("No real solutions")
elseif delta==0 then
   x0=-b/(2*a);
   disp(x0,"x0=")
elseif delta>0 then
   x1=(-b-sqrt(delta))/(2*a);
   x2=(-b+sqrt(delta))/(2*a);
   disp(x1,"x1=")
   disp(x2,"x2=")
end
disp("The apex of the parabola W(p,q)")
disp("p=-b/(2*a) and q=-delta/(4*2)")
p=-b/(2*a);
q=-delta/(4*a)
disp(p,"p=")
disp(q,"q=")
```

Listing 1: Source code [own study]

List of drawings

List of listings