****

Algebraic Equation with complex number coefficients

****

$ Introduction

The solution of the algebraic equation with complex number coefficients,

(An+i*Bn)*X^n + ... + (Ak+i*Bk)*X^k + ... + (A0+i*B0)*X^0 = 0

can be gotten.

[Note] X^p means "X to the p-th power." "i" of "Ak+i*Bk" is the imaginary unit.

$ Function

<Input Coef.> button:
Opens a window for inputting complex number coefficients of the equation.

<Read Data> button:
Opens a window for reading a data file which was saved by <Save Data>, or which was prepared by Excel (*).
(*) : Active-sheet file with Tab, Space, or Comma partitions.

<Rounding> button:
Opens a dialog-box for setting a parameter which is applied to round the solution and the error.

<Solution> button:
Gets the solution of the equation.

<Save Data> button:
Saves the coefficients, the solution, and the error as text format.

<Error> button:
Shows the error of the solution.

<About> button:
Shows version information.

<Help> button:
Shows this file.

<Exit> button:
Exits the application.

$ How to Use (example)

Let us suppose the following equation.

X^3 -7X + 6 =0

This equation is written as follows;

(1+i*0)*X^3 + (0+i*0)*X^2 + (-7+i*0)*X^1 + (6+i*0)*X^0 = 0

Therefore, input the above coefficients in the Re (real part of complex number coefficient) and the Im (imaginary part of complex number coefficient) windows as follows;

6	**0**	**<-- to X^0 windows**
-7	**0**	**<-- to X^1 windows**
0	**0**	**<-- to X^2 windows**
1	**0**	**<-- to X^3 windows**

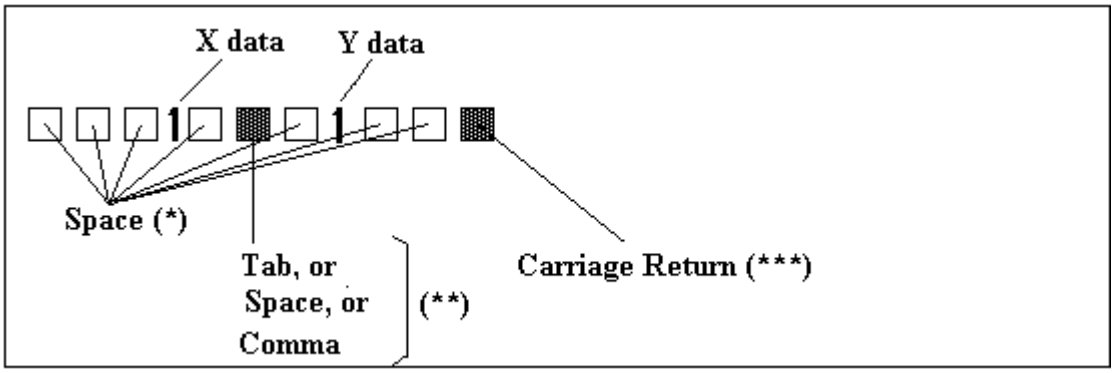
Then, press <Solution> button.

If you apply <Rounding> , set a parameter of the <Rounding> before pressing <Solution> button.

$ Readable Data File

A data file (xxx.TXT) with a series of the following format can be read by the application. In other words, an active-sheet file of Excel, which was prepared by Tab, Space, or Comma partitions, can be read.

[Note] The data file should have a TXT extension.



(*) : Space(s) before X data (real part of complex number coefficient), space(s) after Y data (imaginary part of complex number coefficient), and/or space(s) between X/Y data are allowable.

(**) : Tab, Space, or Comma is used as a partition between X data and Y data.
When using Tab or Comma as a partition, only one Tab or only one Comma should be used.
In these cases, space(s) before/after Tab or Comma are allowable.
When using Space as a partition, one (or, two, three, ...) space(s) should be used.

(***) : A Carriage Return should be placed at the end of one set of X/Y data.
Space(s) between Y data and Carriage Return are allowable.

Others :

1. **Maximum number of digits for X/Y data are 15, including - (minus) sign and a decimal point.**
   An exponential notation number (e.g. 3.5E3) is readable.
2. **Maximum number of X/Y data sets are 30. If a data file has 50 X/Y data sets, only 30 X/Y data sets from the top are read.**

$ File saved by <Save Data>

Active-sheet file of Excel, which has Tab partition, is saved by <Save Data>.
When reading a data file saved by <Save Data>, only X/Y data are read, excluding the equation and the error in the file.

$ Others

1) If you want to get the solution of the Nth degree algebraic equation, input all coefficients in windows below X^N. Keeps windows above X^(N+1) as BLANKs.
Please refer to the above "$ How to Use (example)."

$ Caution

If an algebraic equation has many zero coefficients (real and imaginary parts), the equation sometimes cannot be solved.

1. If an algebraic equation

$$F(X) = A_0 X^n + A_1 X^{n-1} + \cdots\cdots + A_{n-1} X + A_n = 0$$

can be expressed as

$$F(X) = G(X) X^m = 0 \quad [m = 1,2,3,.....]$$

$$G(X) = A_0 X^{n-m} + A_1 X^{n-m-1} + \cdots\cdots + A_{n-m} = 0$$

,

please solve the equation

G(X) = 0.

2. If an algebraic equation

$$F(X) = A_0 X^n + A_1 X^{n-1} + \cdots\cdots + A_{n-1} X + A_n = 0$$

can be expressed as

$$F(X) = A_{n-pm} X^{pm} + A_{n-(p-1)m} X^{(p-1)m} + \cdots\cdots + A_{n-m} X^m + A_n = 0$$

$$[m=2,3,4,..... ; pm=n]$$

,

replace the variable X with Y by

$$X^m = Y$$

and solve the following equation;

$$G(Y) = A_{n-pm}\, Y^{p} + A_{n-(p-1)m}\, Y^{p-1} + \cdots\cdots + A_{n-m}\, Y + A_{n} = 0$$

After getting solutions for Y, please get solutions for X.