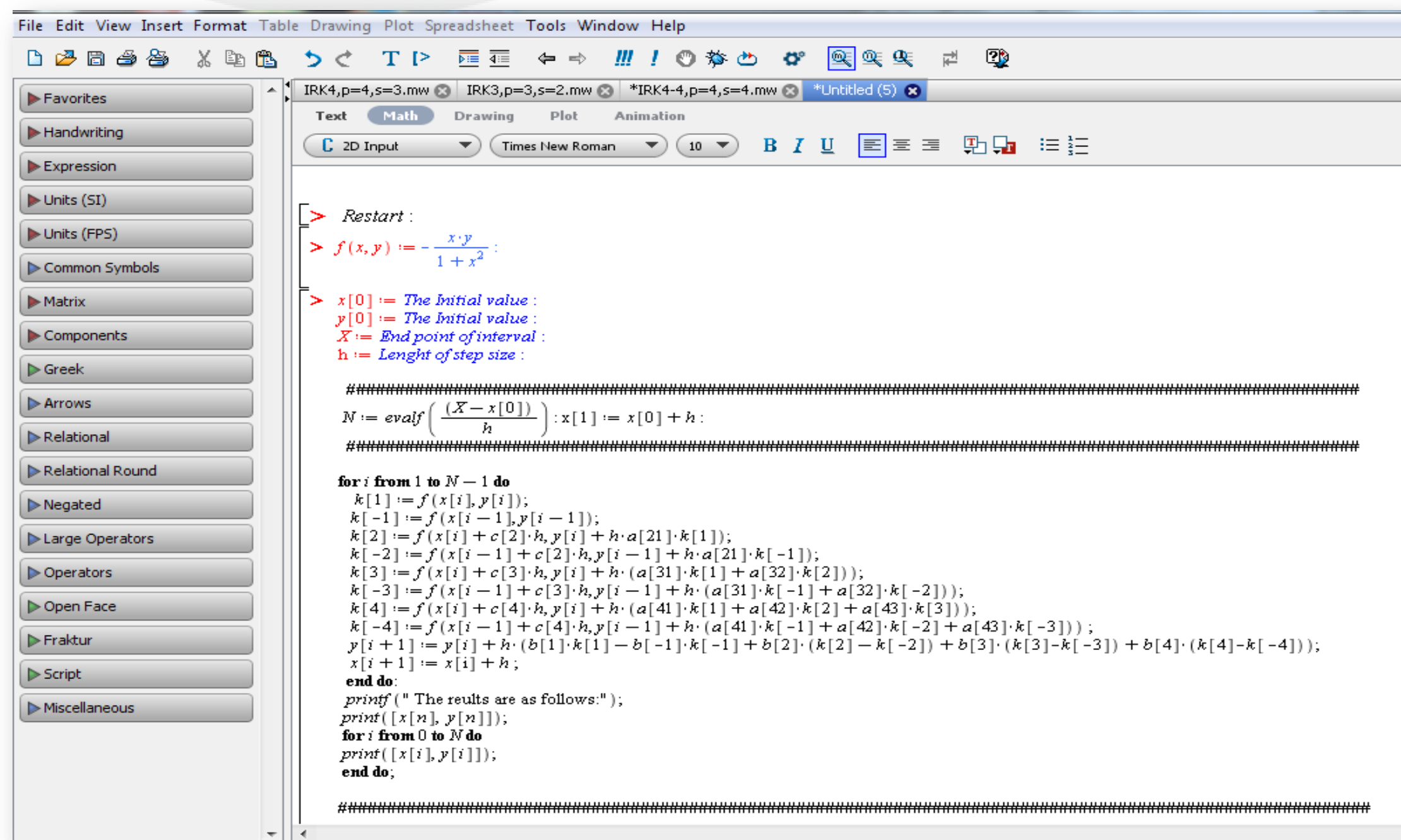# Improved Runge-Kutta Method for Solving ODEs Software

FR-IRK SOFTWARE

ABOUT FR-IRK SOFTWARE

Improved Runge-Kutta (IRK) which is named FR-IRK software is a mathematical software for solving numerical solution of first order ordinary differential equations (ODEs) which arise in many fields of science such as physics, mechanics and etc. FR-IRK is programmed using the Maple.

ADVANTAGES

- FR-IRK software has less computational cost with higher error accuracy compared with existing classical code such as Runge-Kutta (RK) code which is one of the most popular numerical code for solving first order ODEs problems by scientists and in particular engineers.
- FR-IRK program is designed with different orders from order 2 up to order 5, base on how much accuracy is required from clientele by considering the computational cost for solving the given IVPs.

IRK/RK(order of method)	IRK2	RK2	IRK3	RK3	IRK4	IRK4-4	RK4	IRK5	RK6
Number of required stages	1	2	2	3	3	4	4	5	6

COMMERCIAL POTENTIAL

- FR-IRK software by using a new technique has less computational cost and high error accuracy could be one of useful software for scientists for solving first order ODEs.
- FR-IRK software would be used by millions of academic institution for further development of their learning and research. Therefore, the academicians would constitute the largest clientele.
- FR-IRK software could form as a part of mathematical library routines as in Maple, Matlab , Mathematica and other mathematical software.

FR-IRK SOFTWARE MANUAL

1. Go to the windows start menu and open the Maple-like software.

2. Close the Start-up and Quick Help windows.

3. Open the file from toolbar menu.
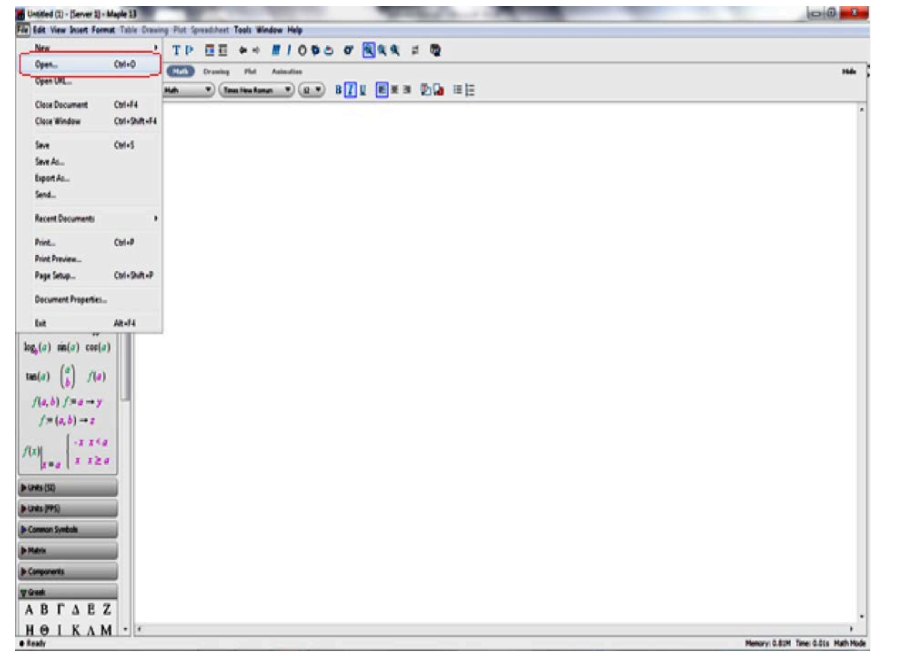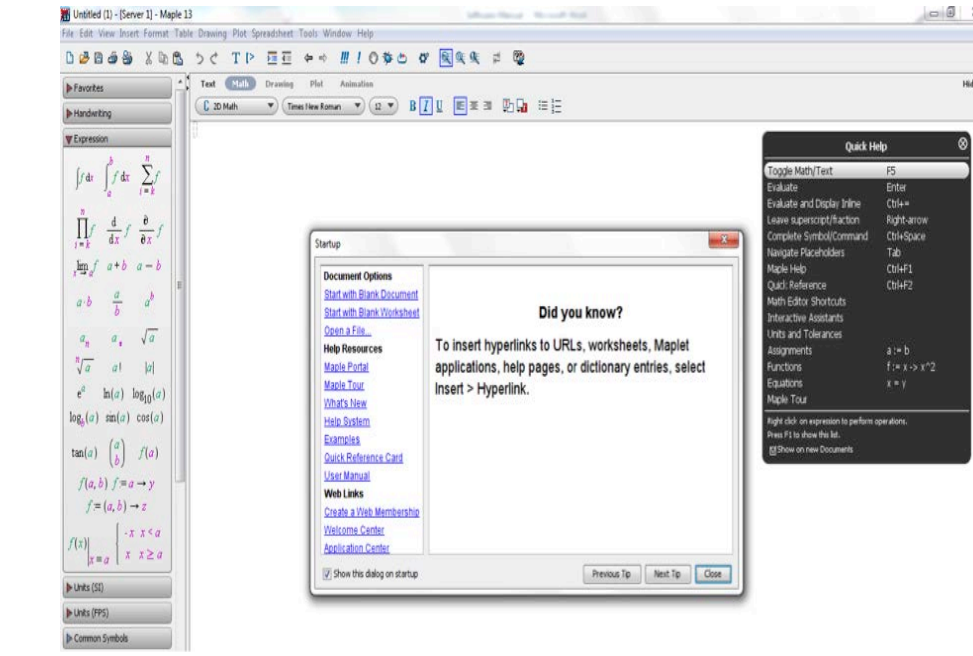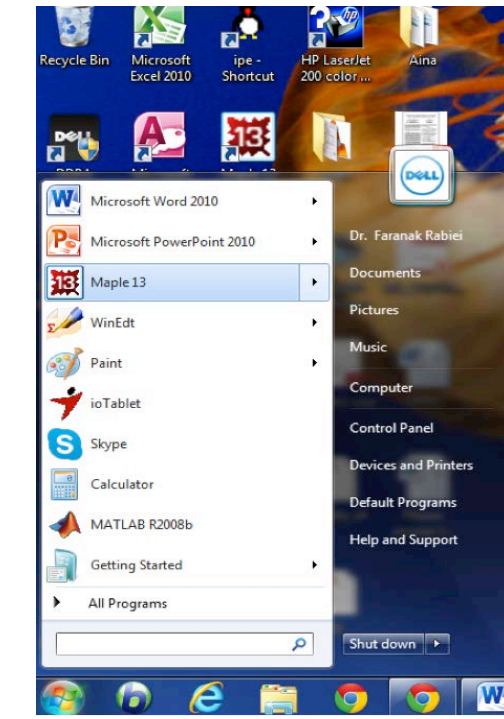
4.1 Click on Open and find the FR-IRK Maple code from your directory and click on button Open.

4.2. Enter the right side function from ODEs equation into function $f(x, y)$.

4.3 Enter the initial values $x0$ into $x[0]$ and $y0$ into $y[0]$.
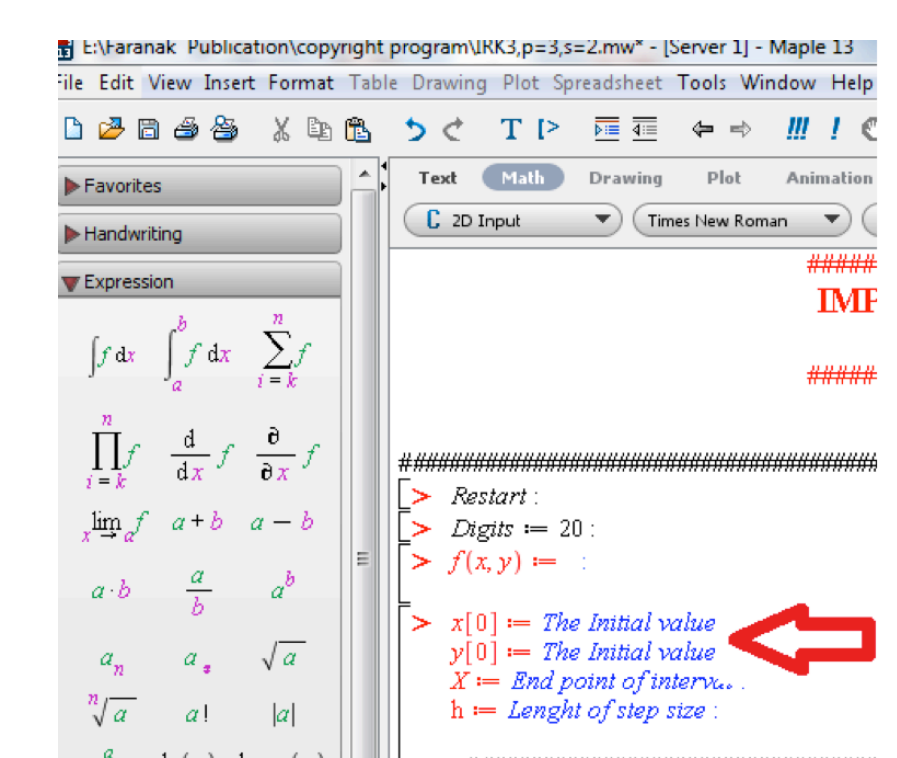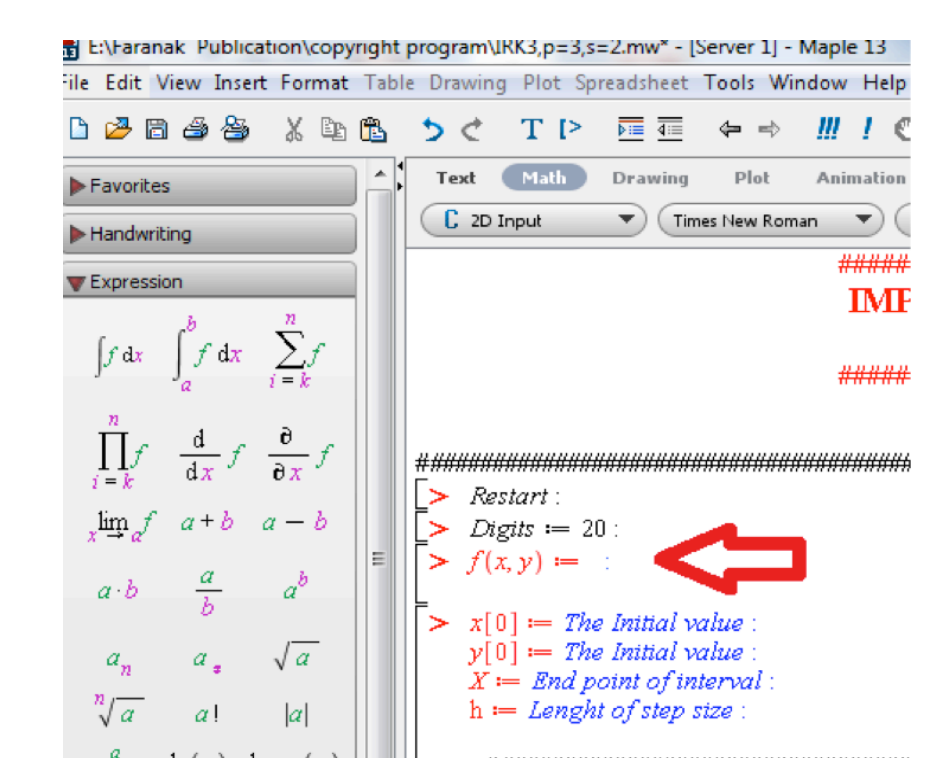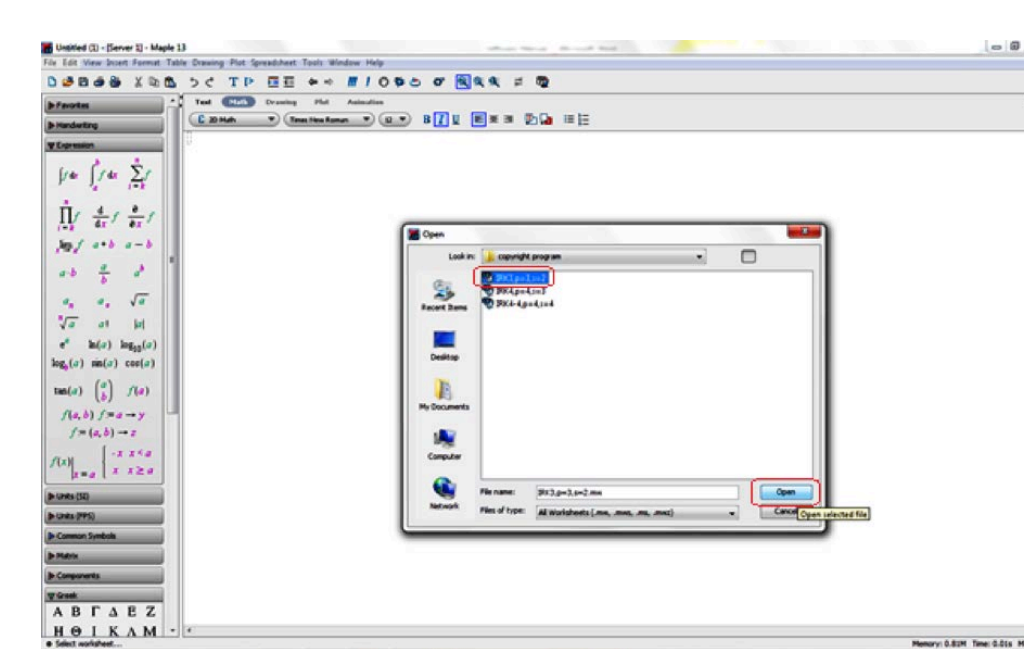
4.4 Enter the end point of required interval into X.

4.5 Enter the appropriate step size length into h (For best accuracy normally h is $0<h\leq1$).

5. Run the programme.

6. In the opened common window chose "Function definition" and click on "Ok".

7. See the results for the values of x, y.

RESULT

The numerical results of a tested problem in step "6", shows that FR-IRK method has less computational cost with higher accuracy compared to the existing classical RK methods. This proves the efficiency of FR-IRK method.
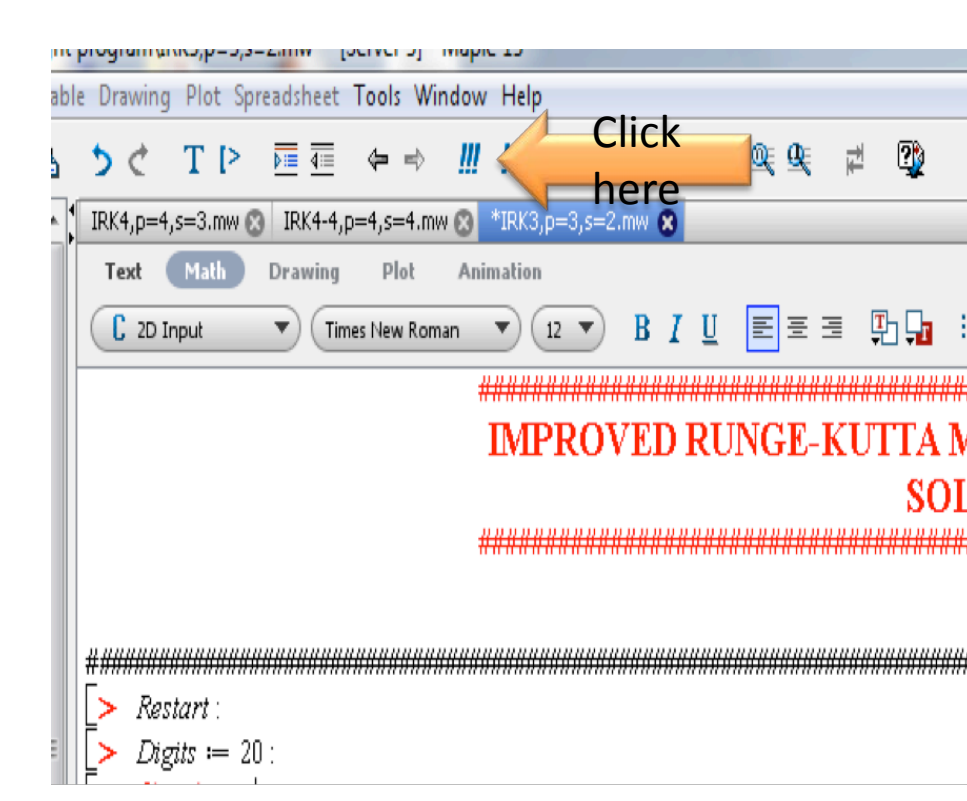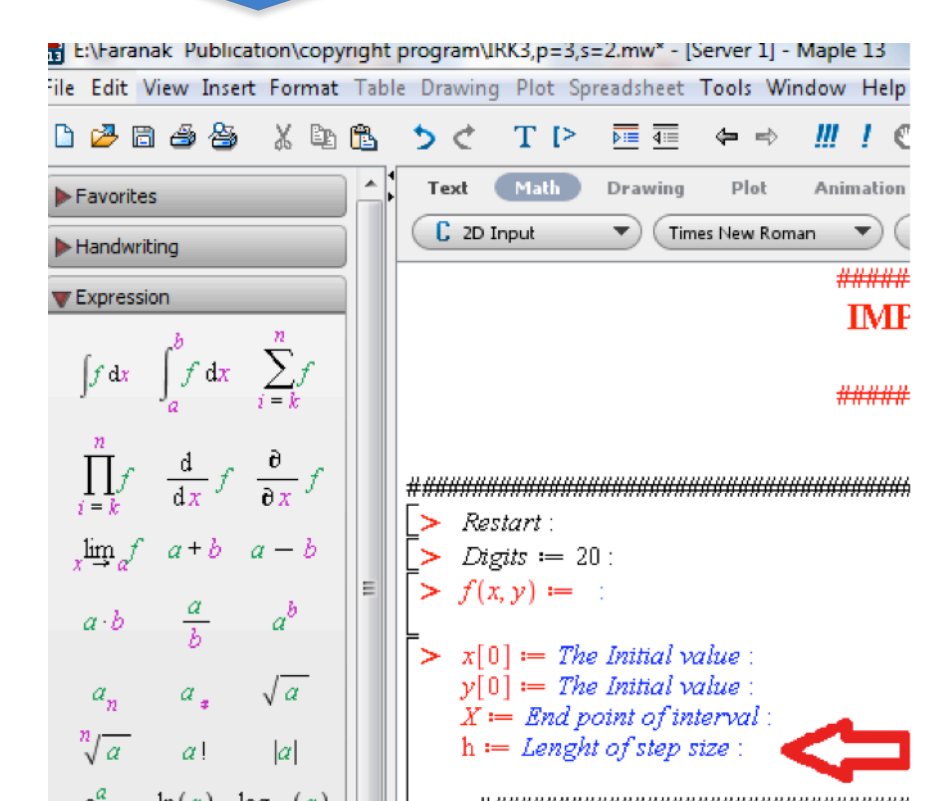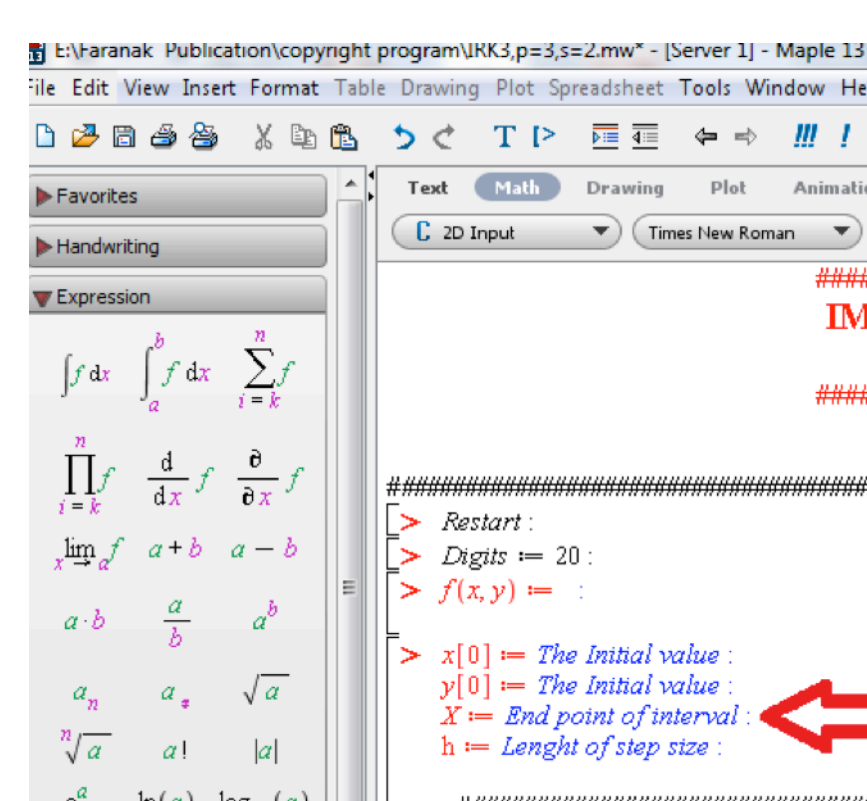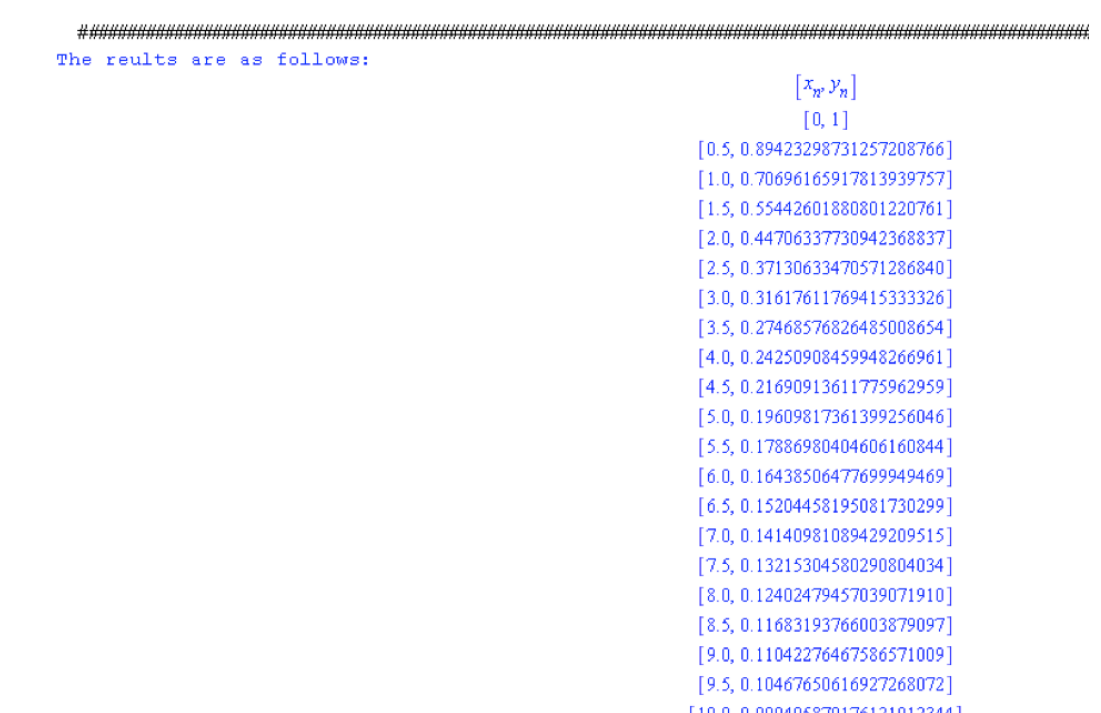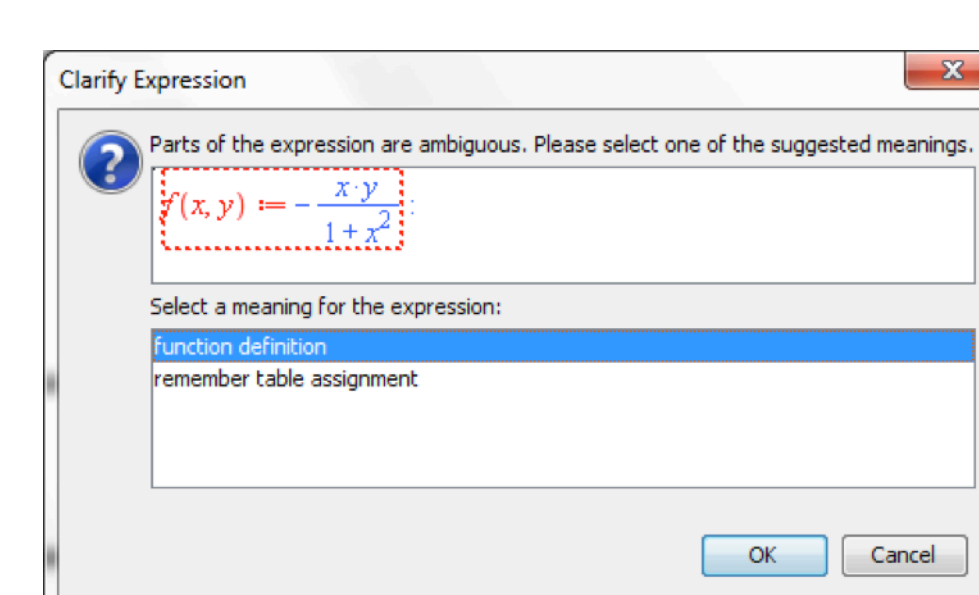
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Expertise: Numerical Analysis