**Non-linear Simultaneous Equations Solver**

The simultaneous equations we have solved so far were all linear. These could have been solved using simple algebraic techniques. Non-linear systems of equations are far more difficult to solve with paper and pencil, requiring a knowledge of calculus. Let us see if Solver is capable of coming to our aid. We will solve the non-linear simultaneous equations:

x2 + 2y2 - 22.0 = 0

-2x2 + xy - 3y + 11.0 = 0

Figure E9 shows the required worksheet with the cell contents displayed as formulas. Set this up on Sheet9 of CHAP 1 O.XLS. Note that cells in B3:B4 have the names shown to the left of each. The required formulas are:

 D3: =x^2 + 2\*y^2 - 22

 D4: =-2\*x^2 + x\*y - 3\*y + 11

 D5: =SUMSQ(D3:D4)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | A | B  |  | B  | I  | C  | D |
| 1 |  | System of Non-linear Equations  |
| 2 |  |  |
| 3 | x  | 1  |  |  | f(x)  | -19  |
| 4 | y | 1 |  |  | g(x) | 7 |
| 5 | x | 1  |  |  | SUMSQ(D3:D4) | 410 |

**Figure E9**

Call Solver. Make D5 the target cell and B3:B4 the variable cells to equate the target cell to 0. With starting values of 1 for both variables Solver needed two attempts to generate the solution

*x* = 2 or (1.99994)

*y* = 3 or (3.0004).

Of course, since the equations contain x2 and y2, therefore multiple solutions are possible.

Starting with 0 for each variable, Solver reported

*x* = 0.2763

*y =* 3.3108