Using the Spreadsheet **Complex Matrix by Decomposition**

In the screen shot below we are using the spreadsheet to solve the three complex simultainous equation:

$\mathbf{Z}_{1A}\mathbf{I}_1 + \mathbf{Z}_{1B}\mathbf{I}_2 + \mathbf{Z}_{1C}\mathbf{I}_3 = \mathbf{V}_1$

$\mathbf{Z}_{2A}\mathbf{I}_1 + \mathbf{Z}_{2B}\mathbf{I}_2 + \mathbf{Z}_{2C}\mathbf{I}_3 = \mathbf{V}_2$

$\mathbf{Z}_{3A}\mathbf{I}_1 + \mathbf{Z}_{3B}\mathbf{I}_2 + \mathbf{Z}_{3C}\mathbf{I}_3 = \mathbf{V}_3$

where $\mathbf{V}_1$ = 6 +j5 volts, $\mathbf{V}_2$ = 20 +j0 volts and $\mathbf{V}_3$ = 20 +j20 volts

$\mathbf{Z}_{1A}$ = 7 +j9 Ω, $\mathbf{Z}_{1B}$ = 5 +j1 Ω, $\mathbf{Z}_{1C}$ = 0 +j1 Ω,

$\mathbf{Z}_{2A}$ = 1 +j9 Ω, $\mathbf{Z}_{2B}$ = 0 +j0 Ω, $\mathbf{Z}_{2C}$ = -5 +j-5 Ω,

$\mathbf{Z}_{3A}$ = 1 +j1 Ω, $\mathbf{Z}_{3B}$ = 5 +j7 Ω, $\mathbf{Z}_{3C}$ = 0 +j0 Ω

$$\overset{[\mathbf{R}]}{\begin{bmatrix} 7.000 & 5.000 & 0.000 \\ 1.000 & 0.000 & -5.000 \\ 1.000 & 5.000 & 0.000 \end{bmatrix}} + j \overset{[\mathbf{X}]}{\begin{bmatrix} 9.00 & 1.00 & 1.00 \\ 9.00 & 0.00 & -5.00 \\ 1.00 & 7.00 & 0.00 \end{bmatrix}} \times \overset{[I]}{\underbrace{\begin{bmatrix} 1.36E-01 \\ 3.20E+00 \\ -2.62E+00 \end{bmatrix} + j \begin{bmatrix} 9.51E-01 \\ -6.91E-01 \\ 3.06E+00 \end{bmatrix}}_{\text{Solution}}} = \overset{[V]}{\begin{bmatrix} 6.000 \\ 20.000 \\ 20.000 \end{bmatrix} + j \begin{bmatrix} 5.000 \\ 0.000 \\ 20.000 \end{bmatrix}}$$

Det[**R**] = 150

Det[**X**] = 373

In polar form

9.61E-01	∠ 81.85
3.27E+00	∠ -12.20
4.03E+00	∠ 130.62

The solution is:

$\mathbf{I}_1$ = 0.136 +j0.951 A

$\mathbf{I}_2$ = 3.2 –j0.691 A

$\mathbf{I}_3$ = -2.62 +j3.06 A.