Notes from http://www.ma.iup.edu/projects/CalcDEMma/JCF/jcf5.html PhL 1.7.05

Now these notes are finally comprehensible to me. At first I did not know what was going on. Notation is all text, so a little ugly. The nice part is that it uses Mathematica to quickly answer questions. In this thing, the author directly computes the Jordan form for two sample matrices.

Here is how he does it:

(1) write your matrix A, find out its eigenvalues. You want to pick an A that has some repeated eigenvalues to make it non-trivial. He does this.

(2) compute the eigenvectors. Here he finds out that one double λ has only one eigenvalue, the second is reported as all zeros. What does Maple do in this situation, let's see!

[1, 2, {vector([1, 0, 0])}], [2, 1, {vector([0, 1, 1])}] value, mult, vector

So Maple just says only one eigenvector for $\lambda = 1$.

(3) next, you have to create the missing generalized eigenvector using

$$A\,\mathbf{v_2}^{(i)} = \lambda_i\,\mathbf{v_2}^{(i)} + \mathbf{v_1}^{(i)}$$

But, just let's now remove the (i) superscript and just thing of the v_i as columns of the overall T. Then we have

$$(A - \lambda I)\,\mathbf{v_2} = \mathbf{v_1}$$

and we know $v_1 = (1,0,0)$ and $\lambda = 1$ and we know A. So we just tell Maple to solve this inhomogeneous equation for v_2 , and Maple does this and gives us (x,2,1) for any x, but Mathematic says (0,2,1) as a viable solution.

(4) You are now done. You have your T, and do similarity on A to get J. I suspect you need to always put 0 in when you can for an unspecified number as in the above case.