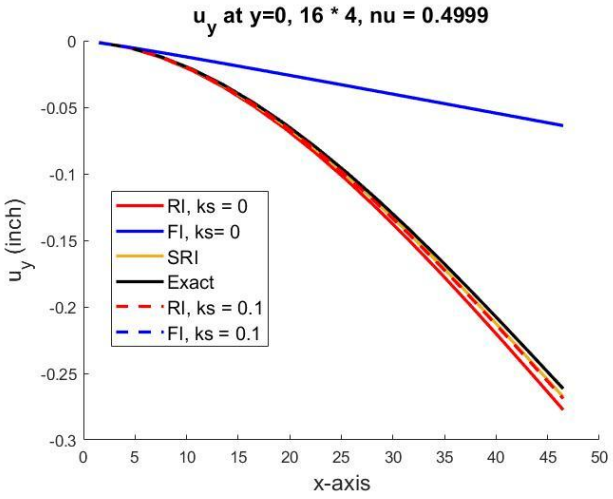
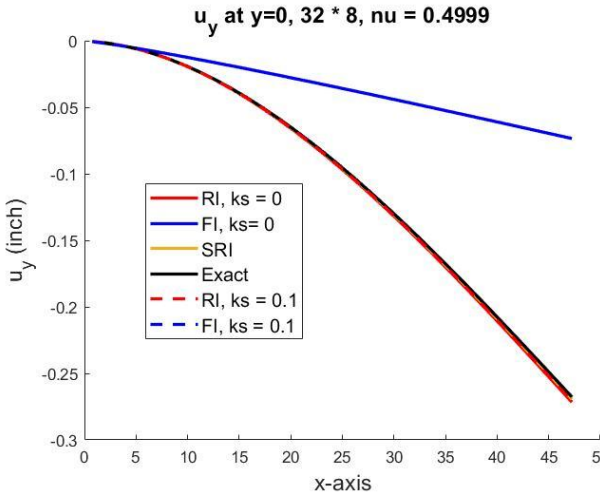
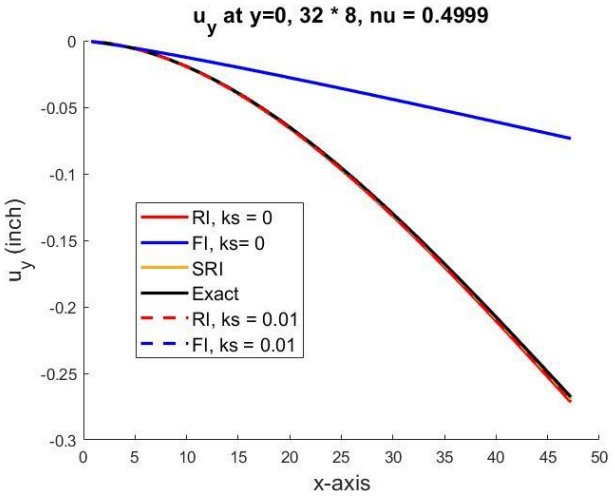
Displacement solution comparison for different methods and discretizations.Here, ks is the control parameter. When ks = 0, no stabilization

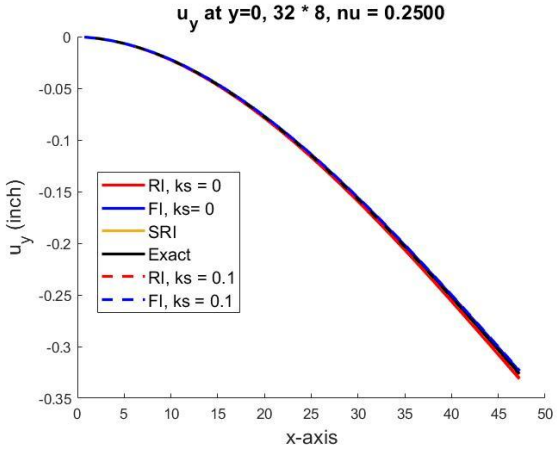




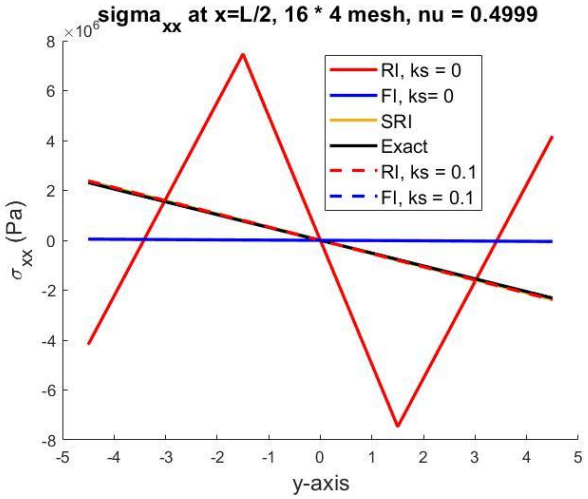


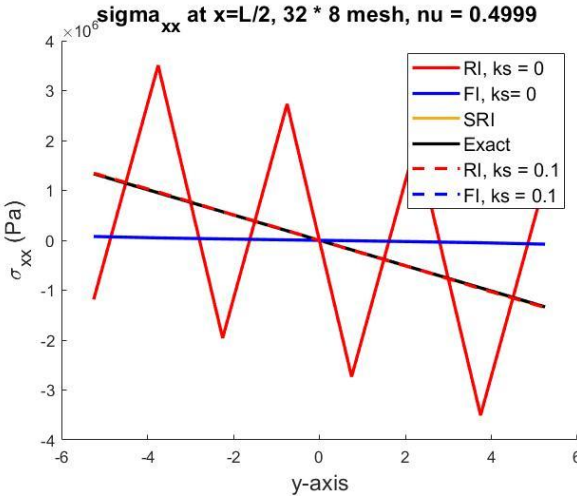
For near incompressible material(nu near 0.5), We see improvement in the accuracy of solution from RI method with introducing stabilisation matrix. Also we observe that the accuracy improves with increasing the value of control parameter ‘ks’.
Though the solution from FI method also improved with stabilisation matrix, its still far off from the exact solution.

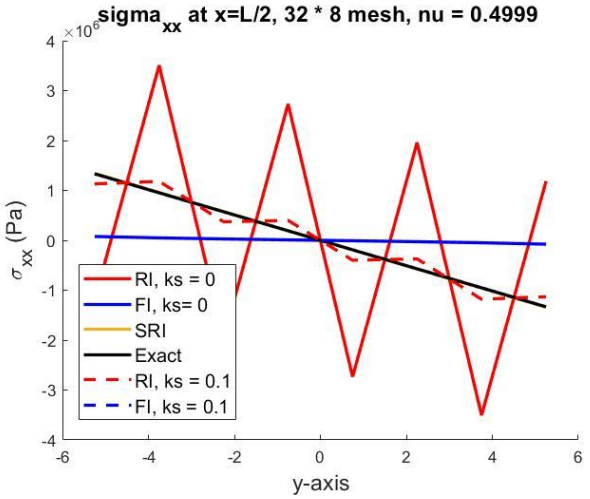
Even at nu 0.25, the accuracy of the solution slightly improved, albeit very small as the solution without any stabilisation is quite close to the exact solution.
The solutions of all the methods improve with refinement



Sigma_xx solution comparison for different methods and discretizations.Here, ks is the control parameter. When ks = 0, no stabilization

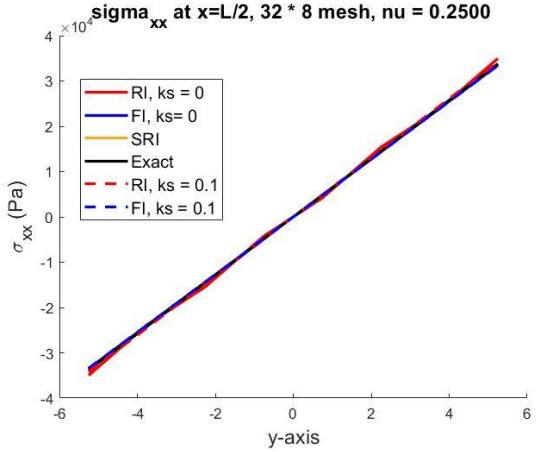




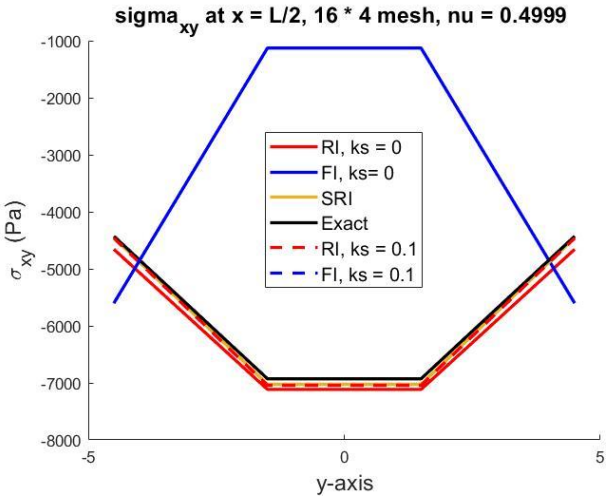


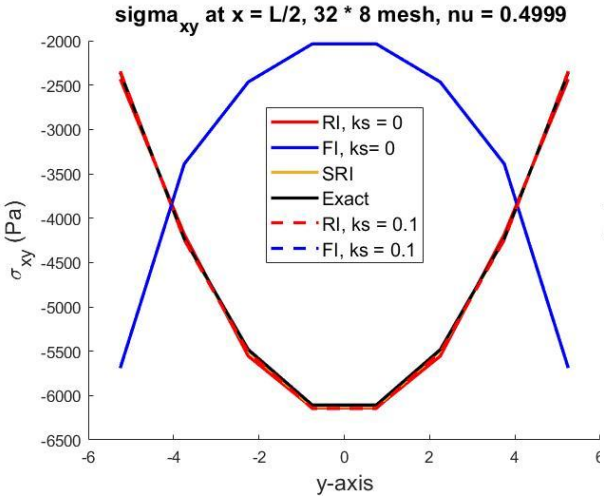
For near incompressible material(nu near 0.5), We see the solution from RI method has lower oscillations with introducing stabilisation . Also we observe that the reduction in oscillation/ improvement of solution is better with greater ‘ks’.

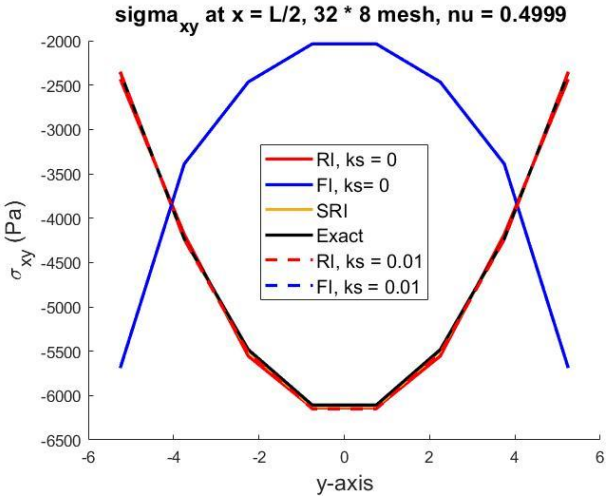
Even at nu 0.25, the stability of the solution improved,though the initial oscillation without any stabilisation is small.
The solutions of all the methods improve with refinement



Sigma_xy solution comparison for different methods and discretizations.Here, ks is the control parameter. When ks = 0, no stabilization

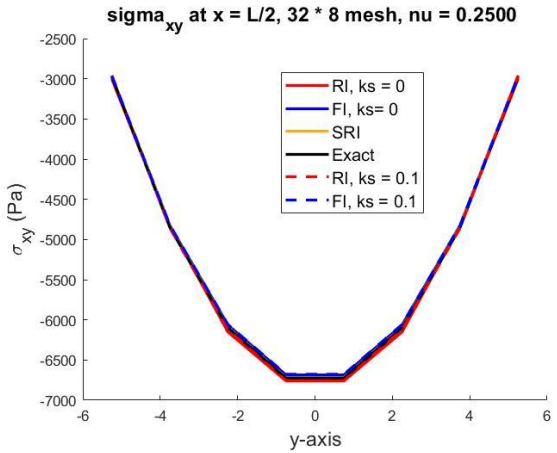




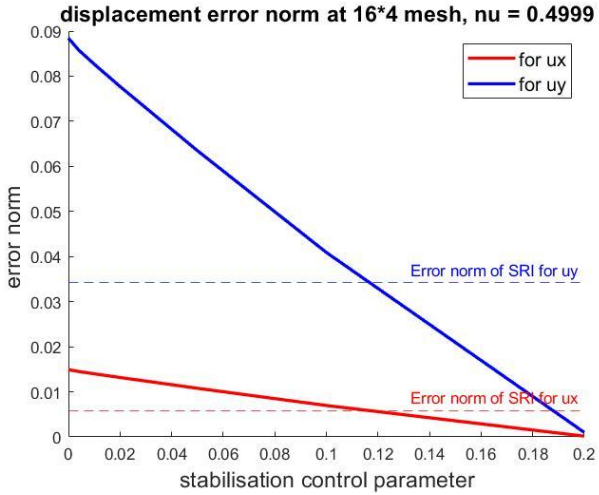


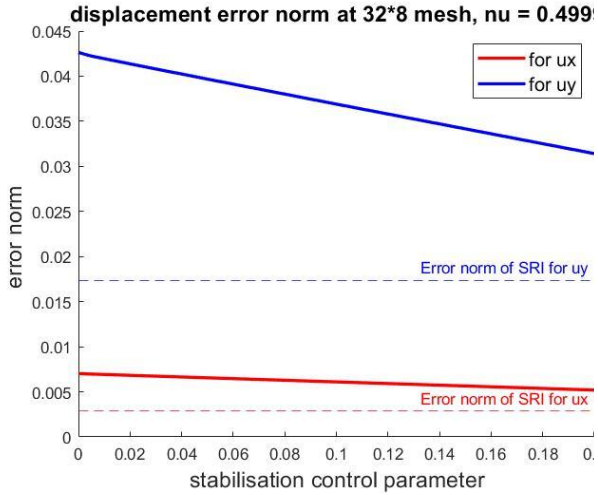
We dont see much oscillations in sigma xy, as it is not being contained. The deviotoric part doesnot have any locking thus effected minimally with Poisson's ratio nearing 0.5.

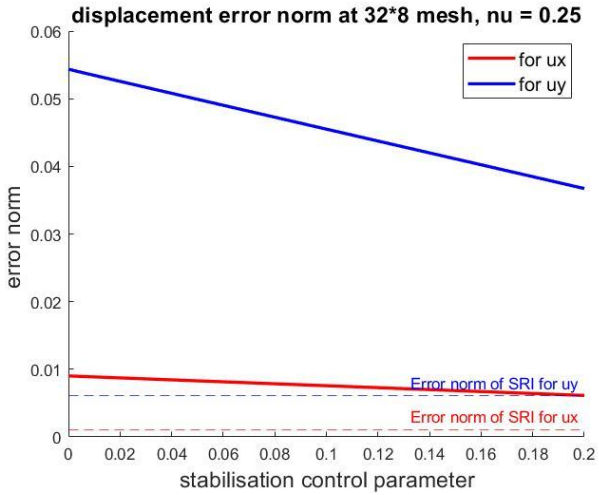
The small oscillations caused because of order reduction is improved with stabilisation parameter. The solution is more accurate with higher ks.



Accuracy comparison by norm of the error





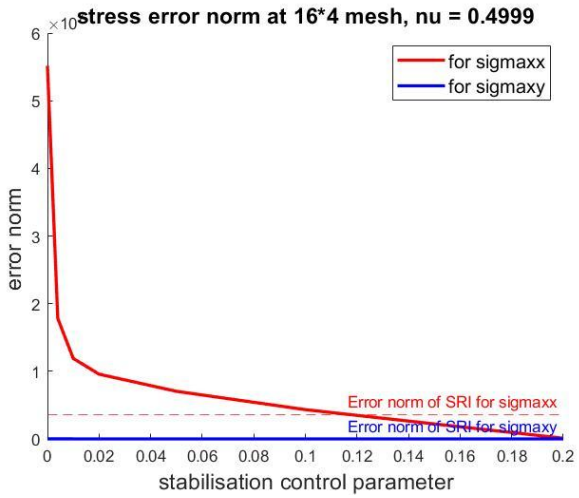


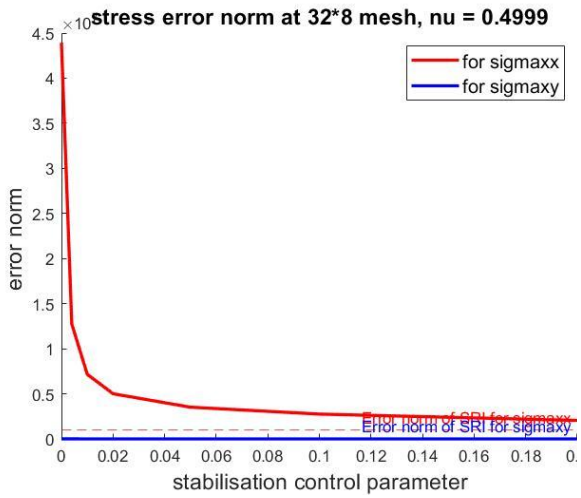
Above is the displacement error norm plot with increasing Ks, the stabilisation control parameter.

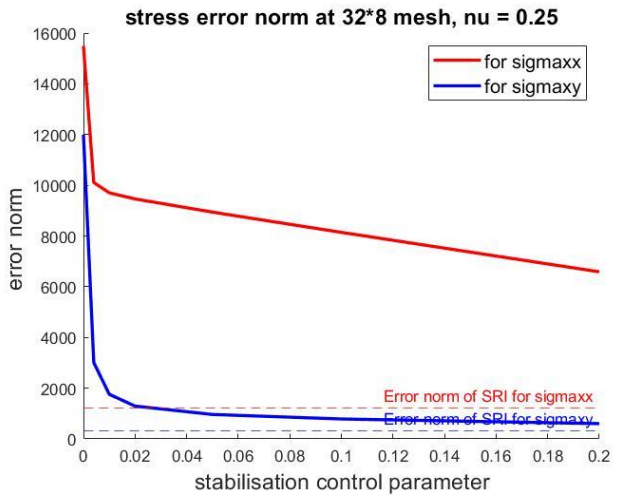
We see that the accuracy is improved with increasing ks parameter. This is true for both the cases when nu nearing 0.5 and in normal case (compressible materials)

We see that until the ks reaches an optimal value, the solution from SRI method is more accurate than from RI method. But after a specific value at a given discretisation, the solution from RI method will be more accurate than SRI method.

Accuracy comparison by norm of the error







Above is the error norm plot of sigma xx and sigma xy with increasing Ks, the stabilisation control parameter.

We see that the sigmaxx accuracy is improved with increasing ks parameter. This is true for both the cases when nu nearing 0.5 and in normal case (compressible materials)

Where as sigma xy seems to be have no error whatsoever for incompressible case; and for compressible, the accuracy improves with ks value

We see that until the ks reaches an optimal value, the sigma xx solution from SRI method is more accurate than from RI method. But after a specific value at a given discretisation, the solution from RI method will be more accurate than SRI method.