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Given this initial system of equations we can use newtons method to solve it.

We find that our exact J matrix is:

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Calculating the exact values for each J matrix we get the following iterations:

k| x1| x2| x3| norm(x(n)-x(n-1))

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01 0.500 -0.017 -0.524 0.500

02 0.500 0.002 -0.524 0.019

03 0.500 0.000 -0.524 0.000

Using approximate values for the J matrix using the formula:

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We get the following iterations:

k| x1| x2| x3| norm(x(n)-x(n-1))

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01 0.500 -0.017 -0.524 0.500

02 0.500 0.002 -0.524 0.018

03 0.500 0.000 -0.524 0.000

In both cases the exact same number of iterations are required to reach the desired tolerance ( E = 1e-3), this is likely due to how quickly this system converges on a solution.