Global Stiffness matrix:

$$KG := \begin{pmatrix} 51.011 & 17.678 & -3.783\cdot10^{-28} & 1.123\cdot10^{-13} & -33.333 & 0 & -17.678 & -17.678 \\ 17.678 & 51.011 & 1.123\cdot10^{-13} & -33.333 & 0 & 0 & -17.678 & -17.678 \\ -3.783\cdot10^{-28} & 1.123\cdot10^{-13} & 61.785 & -11.785 & -11.785 & 11.785 & -50 & 0 \\ 1.123\cdot10^{-13} & -33.333 & -11.785 & 45.118 & 11.785 & -11.785 & 0 & 0 \\ -33.333 & 0 & -11.785 & 11.785 & 1\cdot10^{17} & -11.785 & 0 & 0 \\ 0 & 0 & 11.785 & -11.785 & -11.785 & 1\cdot10^{17} & 0 & 0 \\ -17.678 & -17.678 & -50 & 0 & 0 & 0 & 1\cdot10^{17} & 17.678 \\ -17.678 & -17.678 & 0 & 0 & 0 & 0 & 17.678 & 1\cdot10^{17} \end{pmatrix} kN$$

Load Vector

$$P := \begin{pmatrix} 0 \\ -10 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix} kN$$

Solution for displacements:

$$KG^{-1}\cdot P = \begin{pmatrix} 0.183 \\ -0.527 \\ -0.078 \\ -0.41 \\ 1\cdot10^{-16} \\ -3.91\cdot10^{-17} \\ -1\cdot10^{-16} \\ -6.09\cdot10^{-17} \end{pmatrix} mm$$

These displacements are correct!!

Ok, so now name a variable equal to the above, say 'disp'

$$disp := KG^{-1}\cdot P$$

$$disp = \begin{pmatrix} 0.143 \\ 0.005 \\ -0.58 \\ 1.129 \\ 2.121\cdot10^{-16} \\ 2.837\cdot10^{-15} \\ 0 \\ 8.473\cdot10^{-17} \end{pmatrix} mm$$

These displacements are not correct - why?

Try with small exponential numbers = 0

Global Stiffness matrix:

$$KG := \begin{pmatrix} 51.011 & 17.678 & 0 & 0 & -33.333 & 0 & -17.678 & -17.678 \\ 17.678 & 51.011 & 0 & -33.333 & 0 & 0 & -17.678 & -17.678 \\ -0 & 0 & 61.785 & -11.785 & -11.785 & 11.785 & -50 & 0 \\ 0 & -33.333 & -11.785 & 45.118 & 11.785 & -11.785 & 0 & 0 \\ -33.333 & 0 & -11.785 & 11.785 & 1\cdot 10^{17} & -11.785 & 0 & 0 \\ 0 & 0 & 11.785 & -11.785 & -11.785 & 1\cdot 10^{17} & 0 & 0 \\ -17.678 & -17.678 & -50 & 0 & 0 & 0 & 1\cdot 10^{17} & 17.678 \\ -17.678 & -17.678 & 0 & 0 & 0 & 0 & 17.678 & 1\cdot 10^{17} \end{pmatrix} kN\ mm^{-1}$$

Load Vector

$$P := \begin{pmatrix} 0 \\ -10 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix} kN$$

Solution for displacements:

$$KG^{-1} \cdot P = \begin{pmatrix} 0.183 \\ -0.527 \\ -0.078 \\ -0.41 \\ 1\cdot 10^{-16} \\ -3.91\cdot 10^{-17} \\ -1\cdot 10^{-16} \\ -6.09\cdot 10^{-17} \end{pmatrix} mm$$

These displacements are correct!!

Ok, so now name a variable equal to the above, say 'disp'

$$disp := KG^{-1} \cdot P$$

$$disp = \begin{pmatrix} 0.183 \\ -0.527 \\ -0.078 \\ -0.41 \\ 1\cdot 10^{-16} \\ 0 \\ -1\cdot 10^{-16} \\ -6.09\cdot 10^{-17} \end{pmatrix} mm$$

These displacements are now correct - why?

So this has something to do with the very small non-zero numbers, but why does this work when evaluating the function, but not when you assign a variable to it.