FEA Homework 2

February 13, 2022

Gabe Morris

[1]:
```
import sympy as sp
import numpy as np
import matplotlib.pyplot as plt
from IPython.display import display, Latex

plt.style.use('maroon.mplstyle')

display_latex = lambda text: display(Latex(text))
```

Contents

ME 6233 Homework 2 Gabe Morris
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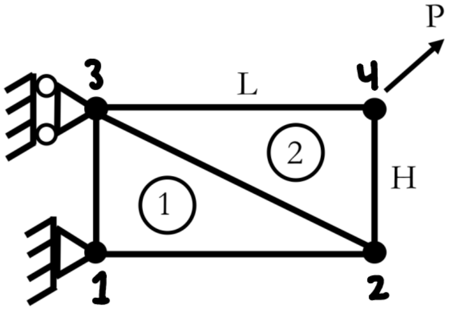
1 Problem 1

1.1 Given



$P = 150\, lb$, $L = 5\, in$, $H = 2\, in$, $t = 0.5\, in$, $E = 30 \cdot 10^6\, psi$, and $\nu = 0.30$

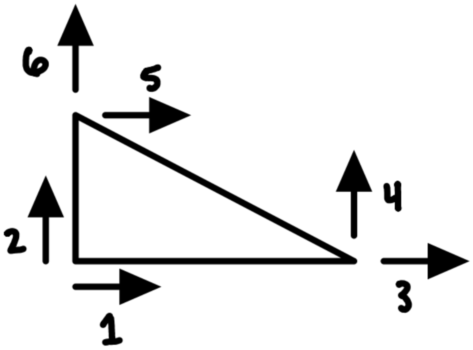
Notice that the global nodes have been rearranged. This was done to make the mapping easier.

1.2 Find

a. The global stiffness matrix
b. The displacements at each node
c. The stresses within each element
d. Plot the undeformed and deformed shape

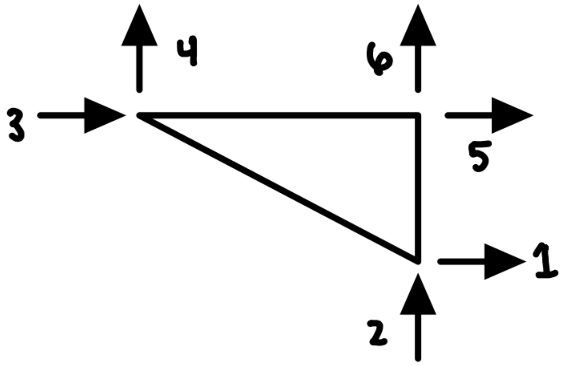
1.3 Solution

For the first element,



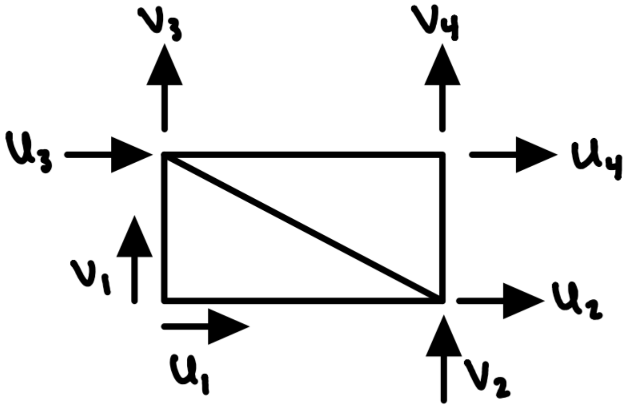
$\delta_1 = \delta_2 = \delta_5 = 0$
$\delta_3 = u_2$
$\delta_4 = v_2$
$\delta_6 = v_3$

For the second element,



$\delta_3 = 0$
$\delta_1 = u_2$
$\delta_2 = v_2$
$\delta_4 = v_3$
$\delta_5 = u_4$
$\delta_6 = v_4$

The global displacements are,



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