In [20]:
```
import sympy as sp
from IPython.display import display, Math, Latex
from sympy.solvers.solveset import linsolve
from sympy import  lambdify, Matrix
import numpy as np
import matplotlib.pyplot as plt
def displayEquations(LHS,RHS):
    left = sp.latex(LHS)
    right = sp.latex(RHS)
    display(Math(left + '=' + right))
def displayLatex(LHS,RHS):
    left = sp.latex(LHS)
    right = sp.latex(RHS)
    display((left + '=' + right))
```

In [21]:
```
varepsilon_x,varepsilon_y,E,sigma_x,sigma_y,nu = sp.symbols('varepsilon_x,varepsilon_y
eqn1 = (E / (1 - nu**2)) * (varepsilon_x + nu*varepsilon_y) - sigma_x
E_eqn1 = sp.solve(eqn1, E)
displayEquations('E',E_eqn1)
displayLatex(E,E_eqn1)
```

$$\mathtt{E} = \left[\frac{\sigma_{x} \left(1 - \nu^{2}\right)}{\nu \varepsilon_{y} + \varepsilon_{x}}\right]$$

```
'E=\\left[ \\frac{\\sigma_{x} \\left(1 - \\nu^{2}\\right)}{\\nu \\varepsilon_{y} +
\\varepsilon_{x}}\\right]'
```

In [22]:
```
j = sp.solve(eqn1,nu)
displayEquations(nu,j)
displayLatex(nu,j)
```

$$\nu=\left[\frac{- E \varepsilon_{y} - \sqrt{E^{2} \varepsilon_{y}^{2} - 4 E \sigma_{x} \varepsilon_{x} + 4 \sigma_{x}^{2}}}{2 \sigma_{x}}, \ \frac{- E \varepsilon_{y} + \sqrt{E^{2} \varepsilon_{y}^{2} - 4 E \sigma_{x} \varepsilon_{x} + 4 \sigma_{x}^{2}}}{2 \sigma_{x}}\right]$$

```
'\\nu=\\left[ \\frac{- E \\varepsilon_{y} - \\sqrt{E^{2} \\varepsilon_{y}^{2} - 4 E
\\sigma_{x} \\varepsilon_{x} + 4 \\sigma_{x}^{2}}}{2 \\sigma_{x}}, \\  \\frac{- E \\v
arepsilon_{y} + \\sqrt{E^{2} \\varepsilon_{y}^{2} - 4 E \\sigma_{x} \\varepsilon_{x}
+ 4 \\sigma_{x}^{2}}}{2 \\sigma_{x}}\\right]'
```

In [30]:
```
eqn2 = (E / (1 - nu**2)) * (varepsilon_y + nu*varepsilon_x) - sigma_y
eqn3 = (eqn1+ sigma_x) / (eqn2 + sigma_y)
k = sp.solve(eqn3,nu)
displayEquations(nu,sigma_x/sigma_y)
displayEquations(nu,eqn3)
displayEquations(nu,k)
displayLatex(nu,sigma_x/sigma_y)
displayLatex(nu,eqn3)
displayLatex(nu,k)
```

$$\nu=\frac{\sigma_{x}}{\sigma_{y}}$$

$$\nu=\frac{\nu \varepsilon_{y} + \varepsilon_{x}}{\nu \varepsilon_{x} + \varepsilon_{y}}$$

$$\nu = \left[-\frac{\varepsilon_x}{\varepsilon_y} \right]$$

```
'\\nu=\\frac{\\sigma_{x}}{\\sigma_{y}}'
'\\nu=\\frac{\\nu \\varepsilon_{y} + \\varepsilon_{x}}{\\nu \\varepsilon_{x} + \\vare
psilon_{y}}'
'\\nu=\\left[ - \\frac{\\varepsilon_{x}}{\\varepsilon_{y}}\\right]'
```