1. Problem 1

Initial guess:

X = [0, 0, 0, 0, 0]

Solution:

X = [[-0.76744186, 0.25581395, 0.62790698, -0.11627907, 0.25581395]

Initial guess:

X = [1, 1, 1, 1, 1]

Solution:

X = [-0.76749312, 0.25583104, 0.62795044, -0.11628835, 0.25583104]

**YES, the initial guess produces slightly different solutions.**

**CODE:**

from scipy import optimize  
from scipy.optimize import Bounds  
  
def obj(x):  
 return (x[0] - x[1])\*\*2 + (x[1] + x[2] - 2)\*\*2 + (x[3] - 1)\*\*2 + (x[4] - 1)\*\*2  
  
def cont1(x):  
 return x[0] + 3\*x[1]  
  
def cont2(x):  
 return x[2] + x[3] - 2\*x[4]  
  
def cont3(x):  
 return x[1] - x[4]  
  
bnds = ((-10, 10), (-10, 10), (-10, 10), (-10, 10), (-10, 10))  
  
const = ({'type': 'eq', 'fun': cont1},  
 {'type': 'eq', 'fun': cont2},  
 {'type': 'eq', 'fun': cont3})  
  
# x0 = [0, 0, 0, 0, 0]  
x0 = [1, 1, 1, 1, 1]  
  
res = optimize.minimize(obj, x0, bounds=bnds, constraints=const)  
  
print(res)