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MP-2 Tutorial-5

In [1]:
```
import numpy as np
from scipy.optimize import minimize
```

In [2]:
```
def objective(x):
    return x[0]*x[3]*(x[0]+x[1]+x[2])+x[2]
```

In [3]:
```
def constraint1(x):
    return x[0]*x[1]*x[2]*x[3]-25.0
```

In [4]:
```
def constraint2(x):
    sum_eq = 40.0
    for i in range(4):
        sum_eq = sum_eq - x[i]**2
    return sum_eq
```

In [5]:
```
# initial guesses
n = 4
x0 = np.zeros(n)
x0[0] = 1.0
x0[1] = 5.0
x0[2] = 5.0
x0[3] = 1.0
```

In [6]:
```
# show initial objective
print('Initial SSE Objective: ' + str(objective(x0)))
```

```
Initial SSE Objective: 16.0
```

In [7]:
```
# optimize
b = (1.0,5.0)
bnds = (b, b, b, b)
con1 = {'type': 'ineq', 'fun': constraint1}
con2 = {'type': 'eq', 'fun': constraint2}
cons = ([con1,con2])
solution = minimize(objective,x0,method='SLSQP',\
                    bounds=bnds, constraints=cons)
x = solution.x
```

In [8]:
```
# show final objective
print('Final SSE Objective: ' + str(objective(x)))
```

```
Final SSE Objective: 17.01401724563517
```

In [9]:
```
# print solution
print('Solution')
print('x1 = ' + str(x[0]))
print('x2 = ' + str(x[1]))
print('x3 = ' + str(x[2]))
print('x4 = ' + str(x[3]))
```

```
Solution
x1 = 1.0
x2 = 4.742996096883977
x3 = 3.8211546234095715
x4 = 1.379407645075325
```