1 and 2

def SA(x0, lb, ub, epsilon=3, max\_iter=5000, t\_start=1000, c=0.99, n=2):

n = 2  
sample\_x = np.array([1, 1])  
epsilon = 2  
lb = np.array([0, 0])  
ub = np.array([10, 10])  
t\_start = 1000  
c = 0.99  
a\_large\_number = 100  
max\_iter = 5000  
xopt, fopt = SA(sample\_x, lb, ub, epsilon, max\_iter, t\_start, c, n)  
print "xopt", xopt  
print "fopt", fopt

fopt -0.337199965356

fopt -0.363822792953

3 ONE PASS

x\_areas\_list = [1. \* 10 \*\* -4] \* 10  
x\_areas = np.array(x\_areas\_list)  
# Minimize the weight of the structure subject to stress constraints  
lb\_list = [0.] \* 10  
ub\_list = [0.0001] \* 10  
lb = np.array(lb\_list)  
ub = np.array(ub\_list)  
epsilon = 0.2 \* ub[0]  
max\_iter = 5000  
t\_start = 1000  
c = 0.99  
get\_perturbed\_values(x\_areas, lb, ub, epsilon)  
xopt, fopt = SA\_3(x\_areas, lb, ub, epsilon, max\_iter, t\_start, c, n)  
print "fopt", fopt  
print "xopt", xopt

fopt 0.00848740959907

xopt [ 4.40932304e-07 3.27304448e-07 3.00439111e-07 2.91507714e-08

7.65766240e-08 4.09857230e-09 1.01433744e-06 5.37947432e-08

1.11877285e-07 2.23999151e-07]

3 QUADRATIC PENALTY

######################## 10-bar Truss ######################  
n = 10  
# Design variable is cross-sectional area. There are 10 of them -- list\_of\_A  
  
#x\_areas = np.array([1 \* 10 \*\* -4, 1 \* 10 \*\* -4, 1 \* 10 \*\* -4, 1 \* 10 \*\* -4, 1 \* 10 \*\* -4,  
# 1 \* 10 \*\* -4, 1 \* 10 \*\* -4, 1 \* 10 \*\* -4, 1 \* 10 \*\* -4, 1 \* 10 \*\* -4])  
x\_areas\_list = [1. \* 10 \*\* -4] \* 10  
x\_areas = np.array(x\_areas\_list)  
# Minimize the weight of the structure subject to stress constraints  
lb\_list = [0.] \* 10  
ub\_list = [0.0001] \* 10  
lb = np.array(lb\_list)  
ub = np.array(ub\_list)  
epsilon = 0.3 \* ub[0]  
max\_iter = 5000  
t\_start = 1000  
c = 0.99  
get\_perturbed\_values(x\_areas, lb, ub, epsilon)  
xopt, fopt = SA\_3(x\_areas, lb, ub, epsilon, max\_iter, t\_start, c, n)  
print "fopt", fopt  
print "xopt", xopt

fopt 0.010418926282

xopt [ 4.55822415e-07 2.09544049e-07 2.92426427e-07 2.22938374e-07

4.68722825e-07 4.88261034e-08 1.00062975e-06 5.92857355e-08

2.52154918e-07 2.18754901e-07]