(7) Practice Problems

(1) Consider the following data-fitting problem:

$$\min_x \|Sx - t\|_1.$$

Implement **subgradient** method for 200 iterations. Choose a diminishing step size of $\alpha_k = 0.02/\sqrt{k}$, and set $x_0 = \mathbf{0}$. Fix the seed and generate the problem parameters as follows:

```
rng(123);
d = 1;
n = 100;
xbar = rand(d,1);
s = rand(n,1)*10-2;
t = s*xbar+randn(n,1);
S = [s,ones(n,1)];
x = zeros(d+1,1);
```

```
np.random.seed(123)
d = 1
n = 100
xbar = np.random.rand(d)
s = np.random.rand(n)*10-2
t = s*xbar+np.random.randn(n)
S = np.column_stack((s,np.ones(n)))
x = np.zeros(d+1)
```

(a) Plot the data points and the line corresponding to the algorithm's output, which fits the data.

(b) Plot the objective function value versus the number of iterations.