For 1 and 11 see the picture after.

2. are support vectors.

3.

4. Fix

5. Plug back to

6. We know that the first point is not the support vector and should be removed from the constraint

7.

8.

Therefore

Where

Rewrite the original optimization problem into quadratic programming (Q.P.) form:

By solving the above optimization problem, it gives

Which means

9.

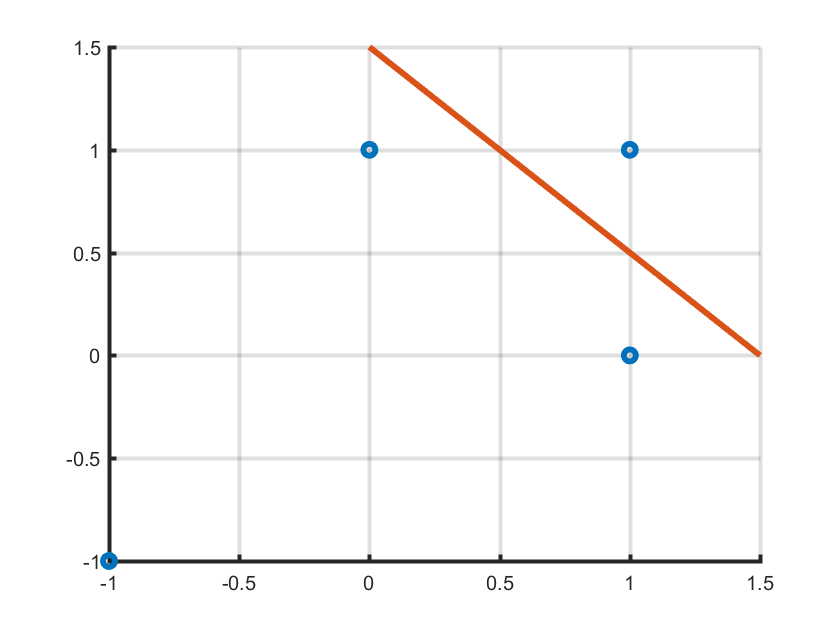
10.

Select a support vector, say , plug it into the above equation:

Therefore:

Therefore:

Which is the same as the initial guess in q1.



close all

clear all

x1 = [1;1];

x2 = [-1;-1];

x3 = [1;0];

x4 = [0;1];

x = [x1 x2 x3 x4];

j = 4;

Y(:,:,4) = [1;-1;-1;-1];

m = 0:0.1:1.5;

k = - m + 1.5;

figure(1)

p1 = scatter(x(1,:), x(2,:));

set(p1, 'linewidth', 3)

hold on

p2 = plot(m,k);

set(p2, 'linewidth', 3)

grid on

set(gca,'linewidth',2)

% support point: x1, x3 and x4

X = transpose(x);

% Formulating Q.P.

H = [2 2 -1 -1; 2 2 -1 -1; -1 -1 1 0; -1 -1 0 1];

f = [-1; -1; -1; -1];

lb = zeros(4,1);

Aeq = [1 -1 -1 -1];

beq = 0;

[x,fval,exitflag,output,lambda] = ...

quadprog(H,f,[],[],Aeq, beq, lb, []);