

```
% MECH 6318 - HW 2
% Jonas Wagner
% 2021-09-07
```

```
clear
close all
```

```
% Problem 5.3 -----
H = [ 2, -3;
     -3, 20]
```

```
H = 2x2
      2    -3
     -3    20
```

```
f = zeros(2,1);
```

```
A = [-2, -1;
     -1, -1]
```

```
A = 2x2
     -2    -1
     -1    -1
```

```
b = [-4;
      5]
```

```
b = 2x1
     -4
      5
```

```
lb = -5
```

```
lb = -5
```

```
ub = 5
```

```
ub = 5
```

```
x0 = ones(2,1)
```

```
x0 = 2x1
      1
      1
```

```
% Part a
[x_opt,f_min] = quadprog(H,f,A,b,[],[],lb,ub)
```

```
x_opt = 2x1
      1.8298
      0.3404
f_min = 2.6383
```

```
% Part b
```

```
[x_opt_b,f_min_b] = quadprog(H,f,A(1,:),b(1,:),[],[],lb,ub)
```

```
x_opt_b = 2×1  
    1.8298  
    0.3404  
f_min_b = 2.6383
```

```
% Part c
```

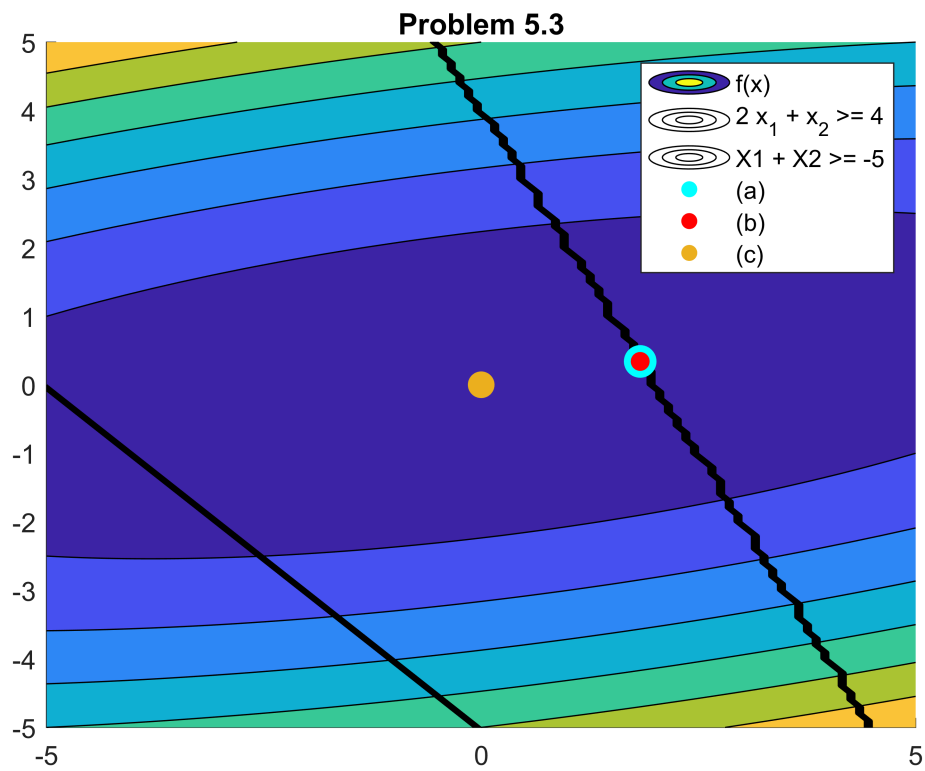
```
[x_opt_c,f_min_c] = quadprog(H,f,[],[],[],[],lb,ub)
```

```
x_opt_c = 2×1  
     0  
     0  
f_min_c = 0
```

```
% Part d
```

```
[X1,X2] = meshgrid(lb:0.1:ub,lb:0.1:ub);  
F = X1.^2 + 10.*X2.^2 - 3.*X1.*X2;
```

```
figure()  
hold on  
contourf(X1, X2, F, 'DisplayName', 'f(x)')  
contour(X1, X2, 2 * X1 + X2 >= 4, 'k',...  
    'DisplayName', '2 x_1 + x_2 >= 4')  
contour(X1, X2, X1 + X2 >= -5, 'k',...  
    'DisplayName', 'X1 + X2 >= -5')  
scatter(x_opt(1),x_opt(2), 150, 'filled', 'c',...  
    'DisplayName', '(a)')  
scatter(x_opt_b(1),x_opt_b(2), 50, 'filled', 'r',...  
    'DisplayName', '(b)')  
scatter(x_opt_c(1),x_opt_c(2), 100, 'filled', 'o',...  
    'DisplayName', '(c)')  
legend  
title('Problem 5.3')
```



```
% Problem 5.4 -----
f = [20; 64]
```

```
f = 2x1
    20
    64
```

```
A = [-25, -70]
```

```
A = 1x2
    -25    -70
```

```
b = -2100
```

```
b = -2100
```

```
lb = [ 0;  0]
```

```
lb = 2x1
     0
     0
```

```
ub = [70; 50]
```

```
ub = 2x1
    70
    50
```

```
% Part a
[x_opt, f_opt] = linprog(f, A, b, [], [], lb, ub)
```

```
x_opt = 2×1
      70
       5
f_opt = 1720
```

```
% Part b
[x_opt_b, f_obt_b] = fmincon(...
    @(x) 20 * x(1) + 64 * x(2),...
    [0; 0], A, b, [], [], lb, ub)
```

Local minimum found that satisfies the constraints.

Optimization completed because the objective function is non-decreasing in feasible directions, to within the value of the optimality tolerance, and constraints are satisfied to within the value of the constraint tolerance.

<stopping criteria details>

```
x_opt_b = 2×1
      70.0000
       5.0000
f_obt_b = 1.7200e+03
```