

4(a)

```
1 - x0 = [1000;1]
2 - Q = [1,0;0,900]
3 - p = 0
4 - esp = 10^(-8)
5 - flag = 1;
6 - iter = 0;
7 - while flag > esp
8 -     grad = Q*x0+p;
9 -     temp1 = grad'*grad;
10 -    if temp1 < 10^(-12)
11 -        flag = esp;
12 -    else
13 -        stepsize = temp1/(grad'*Q*grad);
14 -        x1 = x0 - stepsize*grad;
15 -        flag = norm(x1-x0);
16 -        x0 = x1;
17 -    end;
18 -    iter = iter + 1;
19 - end;
20 - x = x0;
21 - fvalue = 0.5*x'*Q*x+p'*x;
22
23 - disp("iteration: "),disp(iter)
24 - disp("x0: "),disp(x0),
25 - disp("fvalue: "),disp(fvalue)
```

```
iteration:
      8690
```

```
x0:
      1.0e-05 *
      0.3312
      0.0003
```

```
fvalue:
      1.0e-11 *
      0.5489
      0.5489
```

4(b)

```
1 - x0 = [1000;1]
2 - Q = [1,0;0,900]
3 - p = 0
4 - esp = 10^(-8);
5 - iter = 0;
6 - grad = Q*x0+p;
7 - fvalue = 0.5*x0'*Q*x0+p'*x0;
8
9 - while grad > esp
10 -     d = inv(Q)*grad*-1;
11 -     x1 = x0 + d;
12 -     x0 = x1;
13 -     grad = Q*x0+p;
14 -     iter = iter + 1;
15 -     fvalue = 0.5*x0'*Q*x0+p'*x0;
16 - end
17
18 - disp("iter:"),disp(iter)
19 - disp("x0:"),disp(x0)
20 - disp("fvalue:"),disp(fvalue)
```

```
iter:
    1

x0:
    0
    0

fvalue:
    0
    0
```

5

norm-1

```

1 - f = [0;0;1;1;1;1;1]
2 - A = [1 2 -1 0 0 0 0;
3       2 -1 0 -1 0 0 0;
4       1 1 0 0 -1 0 0;
5       4 -1 0 0 0 -1 0;
6       1 -1 0 0 0 0 -1;
7       -1 -2 -1 0 0 0 0;
8       -2 1 0 -1 0 0 0;
9       -1 -1 0 0 -1 0 0;
10      -4 1 0 0 0 -1 0;
11      -1 1 0 0 0 0 -1]
12 - b = [2;-2;1;0;-2;-2;2;-1;0;2]
13
14 - x = linprog(f,A,b)
15 - disp(x)
16 - disp(x(3)+x(4)+x(5)+x(6)+x(7))

```

0.2222

0.8889

0

1.5556

0.1111

0

1.3333

3

norm-2

```

1 - A = [1 2;2 -1;1 1;4 -1;1 -1];
2 - b = [2;-2;1;0;-2];
3 - x = A\b;
4 - disp(x)
5 - disp(norm(A*x-b))

```

0.0714

1.1607

1.6637

norm-infinite

```
1 - f = [0;0;1]
2 - A = [1 2 -1;
3       2 -1 -1;
4       1 1 -1;
5       4 -1 -1;
6       1 -1 -1;
7       -1 -2 -1;
8       -2 1 -1;
9       -1 -1 -1;
10      -4 1 -1;
11      -1 1 -1]
12 - b = [2;-2;1;0;-2;-2;2;-1;0;2]
13
14 - x = linprog(f,A,b)
15 - disp(x)
```

0.1250

1.3750

0.8750

