

Convex Optimization

810100511

```
% Hw7 --> Q7
clear; clc; close all;

% Load Data:
run('one_bit_meas_data.m');
```

```
[m,n] = size(A);
A = diag(y)*A;
b = y.*b;
x = A\b; % SOLve the Linear System of Eqs.
f_prime_hist = [];
for k=1:100 % solve for 100 steps:
    w = A*x-b;
    Phi = 0.5*erfc( -w/sqrt(2) ); % MATLAB erfc() func
    Phix = 0.5*sqrt(2*pi) * erfcx(-w/sqrt(2)); % MATLAB erfcx() func
    val = -sum(log(Phi));
    Gradient = -A'* (1./Phix);
    Hessian = A'* diag((w + 1./Phix)./Phix) * A;
    v = -Hessian\Gradient;
    f_prime = Gradient'*v;
    f_prime_hist = [f_prime_hist f_prime ];
    disp("f_prime at step = "+k + " is : ")
    disp(f_prime)
    if (-f_prime/2 < 1e-8)
        iter =k;
        disp("Solved!")
        break
    end

    t = 1;
    while ( -sum(log( 0.5*erfc(-(A*(x+t*v)-b)/sqrt(2)) ) ) > val + 0.01*t*f_prime )

        t = t/2;
    end
    x = x + t*v;
end
```

```
f_prime at step = 1 is :
-6.647512456315127
f_prime at step = 2 is :
-1.684273113499678
f_prime at step = 3 is :
```

```

-0.242787635885709
f_prime at step = 4 is :
-4.070269691846316e-04
f_prime at step = 5 is :
-3.911026543977576e-09
Solved!

```

```

% Answer:
disp(x')

```

Columns 1 through 6

```

-0.270676032856806    9.148453297062034    7.978619693215202    6.703460463844741    6.026654454532209    5.01204114510

```

Columns 7 through 10

```

4.299797452899707    2.676482766549737    2.020789542898919    0.683783716891069

```

```

figure()
semilogy(1:iter,abs(f_prime_hist),'b--')
title('f_prime VS num of steps')
grid on

```

