

## Appendix

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### Matlab code for Steepest descent method

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```
disp('Steepest method')
syms x y
f = input('f(x)=');
e=input('tol=');
Xk=input('initial x_0=');
tic
Q=hessian(f,[x,y]);
Q=inline(Q,'x','y');
F=inline(f,'x','y');
f=inline(gradient(f),'x','y');
x=Xk(1);y=Xk(2);
gk=f(x,y);
disp(' X   gk   f(X)')
i=0;
while norm(gk)>e
    alpha=(transpose(gk)*gk)/(transpose(gk)*Q(x,y)*gk);
    Xk=Xk-alpha*gk;
    x=Xk(1);y=Xk(2);
    gk=f(x,y);
    disp([Xk,gk,[F(x,y);0]])
    i=i+1;
end
toc
```

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## Matlab code for Conjugate gradient method

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```
disp('Conjugate gradient method')
syms x y
f = input('f(x)=');
e=input('tol=');
Xk=input('initial x_0=');
tic
Q=hessian(f,[x,y]);
Q=inline(Q,'x','y');
F=inline(f,'x','y');
f=inline(gradient(f),'x','y');
x=Xk(1);y=Xk(2);
gk=f(x,y);
d=-gk;
disp(' X   gk   f(X)')
i=0;
while norm(gk)>e
    alpha=-((transpose(gk)*d)/(transpose(d)*Q(x,y)*d));
    Xk=Xk+alpha*d;
    x=Xk(1);y=Xk(2);
    gk=f(x,y);
    disp([Xk,gk,[F(x,y);0]])
    beta=((transpose(gk)*Q(x,y)*d)/(transpose(d)*Q(x,y)*d));
    d=-gk+beta*d;
i=i+1;
end
toc
```

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## Quality of the Computer

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The computer that has been used for this work has the following properties:

Intel(R) Core(TM) i7-8750H CPU @ 2.20GHz.