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Problem 1

```
clc;
clear all;
close all;

[A,fval]=fminunc(@As5,[1 1 1]); %calculating minimum value of function defined in
[A,fval];                       %initial values x=y=z=1
Fmin=fval                       %Fmin is the minimum value of function
A                               %Minima of the function is: x=A(1), y=A(2), z=A(3)
```

```
Warning: Gradient must be provided for trust-region algorithm;
  using line-search algorithm instead.

Local minimum found.

Optimization completed because the size of the gradient is less than
the default value of the function tolerance.



Fmin =

   -0.5000


A =

    0.5000    0.5000   -0.0000
```

Problem 2

```
% Solving using Newton Raphson method and comparing with true solution

clc
clear all
close all


x=0.05; % Initial value of x

xold=0;
```

```
while ((x-xold)>0.001) % Stopping criteria - error is 0.001
xold=x;                % Storing value of previous x in variable xold, so that it
syms x                 % Converting to variable form
y=(x^3)-0.165*(x^2)+3.993*10^(-4);

dy=diff(y,x);          % Derivative of f
x=xold;                % x is assigned back its value.
x=x-eval(y)/eval(dy);  % new x value

end

x
```

```
x =

    0.0624
```

Problem 3

```
clc;
clear all;
close all;

% Problem 3.a
M=0.046;        %M=mass of ball in Kg
r=0.021;        %r=radius of ball in meter
u=35.5;         %u=initial velocity of ball in m/s
[theta,fval]=fminunc(@range,0); %calculating maximum value of function and corresp
Angle=theta*180/pi       %angle(in degree) for which horizontal range is maximized
MaxRange=-fval           %maximum range corresponding to angle theta


% Problem 3.b
[thet,fval]=fminunc(@range2,0);
Horizontalrange=-fval
thet=(thet)*180/pi
```

```
Warning: Gradient must be provided for trust-region algorithm;
  using line-search algorithm instead.

Local minimum found.

Optimization completed because the size of the gradient is less than
the default value of the function tolerance.



Angle =

   45.0000
```

```
MaxRange =

  128.5969

Warning: Gradient must be provided for trust-region algorithm;
  using line-search algorithm instead.

Local minimum possible.

fminunc stopped because it cannot decrease the objective function
along the current search direction.



Horizontalrange =

  174.9014


thet =

   12.2115
```

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