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```
%{
Written by Tianyu Gao
%}
function Assignmeng_2_4()
```

Problem a:

$$f(x) = x^3 - 5x^2 + 7x - 3$$

$$f(x) = (x-1)^2(x-3)$$

The roots of $f(x)$ is 1,1,3

Problem b,c:

$$f(x) = x^3 - 5x^2 + 7x - 3$$

$$f^{(1)}(x) = 3x^2 - 10x$$

$$f^{(2)}(x) = 6x$$

```
clc
clear all
x1 = 0; % initial guess for standard update function
x2 = 0; % initial guess for modified update function
X1 = zeros(5,1);
X2 = zeros(5,1);

for i = 1:5
    y1 = NR(x1);
    x1 = x1 + y1;
    X1(i) = x1;

end
for i = 1:5
```

```
    y2 = mNR(x2);
    x2 = x2 + y2;
    X2(i) = x2;
end
disp('Problem b: Standard function:')
vpa(X1,8)
disp('Problem C: Modified function:')
vpa(X2,8)
```

Proble d:

```
x1 = 4; % initial guess for standard update function
x2 = 4; % initial guess for modified update function
X1 = zeros(5,1);
X2 = zeros(5,1);

for i = 1:5
    y1 = NR(x1);
    x1 = x1 + y1;
    X1(i) = x1;

end
for i = 1:5
    y2 = mNR(x2);
    x2 = x2 + y2;
    X2(i) = x2;
end
disp('Problem d: Standard function:')
vpa(X1,8)
disp('Problem d: Modified function:')
vpa(X2,8)
```

```
Problem d: Standard function:

ans =

       3.4
       3.1
 3.0086957
 3.0000746
       3.0

Problem d: Modified function:

ans =

 2.6363636
 2.8202247
 2.9617282
 2.9984787
 2.9999977


end
```

Function

```
function [y] = fx(x)    % f(x)
y = x^3 - 5*x^2 + 7*x -3;
end
function [y] = f1x(x)   % first derivative function
y = 3*x^2 - 10 * x + 7;
end
function [y] = f2x(x)  % second deritivative function
y = 6*x - 10;
end
function [y] = NR(x)   % standard update function
y = -fx(x)/f1x(x);
end
function [y]= mNR(x)   % modified update function
y = -fx(x)*f1x(x)/(f1x(x)^2 - fx(x)*f2x(x));
end
% The result is different from that of b,c, which means different
initial
% guesses may yeild different roots.
```

```
Problem b: Standard function:

ans =

 0.42857143
 0.68571429
  0.8328654
 0.91332989
 0.95578329

Problem C: Modified function:

ans =

 1.1052632
 1.0030817
 1.0000024
       1.0
       1.0
```

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