```
%% Problem 2 fsolve

fun = @(x) sin(x)+ sin(10*x/3);
x0 = [0:0.1:1]; % initial guess
x_min = fsolve(fun,x0) % answer using fsolve is  1.34639685
% rest of the problem is analyzed in the testTriSection code



%% Problem 1


syms  x1 x2 x3 x4 x5

f = 100*(x2 - x1^2)^2 + (x1 - 1)^2 + 100*(x3 - x2^2)^2 + (x2 - 1)^2 ...
    + 100*(x4 - x3^2)^2 + (x3 - 1)^2 + 100*(x5 - x4^2)^2 + (x4 - 1)^2;

f_fixed = subs(f, [x3, x4, x5], [1, 1, 1]);
ezsurf(f_fixed, [-2, 2])



%1a)
% upon inspection of the mesh and, it looks like the minimum resides where x1,x2,x3,x4, ↙
x5
% all equal 1 and f is equal to 0. Therefore the local minimum is @
% (1,1,1,1,1) and f=0

gradient_f = gradient(f, [x1, x2, x3, x4 ,x5])

% setting the gradient equal to 0, Xn=1

x1=1;
x2=1;
x3=1;
x4=1;
x5=1;

 gradient_f =  2*x1 - 400*x1*(- x1^2 + x2) - 2 ...
- 200*x1^2 + 202*x2 - 400*x2*(x3 - x2^2) - 2  ...
- 200*x2^2 + 202*x3 - 400*x3*(x4 - x3^2) - 2  ...
- 200*x3^2 + 202*x4 - 400*x4*(x5 - x4^2) - 2 ...
                        - 200*x4^2 + 200*x5


  % gradient_f =

     0
```

```
  % gradient_f = 0 when evaluted at Xn = 1


% 1b)
% when evaulating the gradient of the rosenbrock function when N=5
% at X1,X2,X3,X4,X5 = 1, f is equal to 0. Therefore, the first order
% conditions are satisifed at the local minimum


H = hessian(f, [x1, x2, x3, x4, x5])


%[1200*x1^2 - 400*x2 + 2,                  -400*x1,                          0, ↙
0,       0]
%[               -400*x1, 1200*x2^2 - 400*x3 + 202,                  -400*x2, ↙
0,       0]
%[                     0,                  -400*x2, 1200*x3^2 - 400*x4 + 202, ↙
-400*x3,       0]
%[                     0,                       0,                  -400*x3, 1200*x4^2 ↙
- 400*x5 + 202, -400*x4]
%[                     0,                       0,                          0, ↙
-400*x4,     200]

%H =
%
%         802        -400           0           0           0
%        -400        1002        -400           0           0
%           0        -400        1002        -400           0
%           0           0        -400        1002        -400
%           0           0           0        -400         200

eig(H)


%1c) The eigen values are all positive so the second order requirement is
%satisfied!

%ans =

%   1.0e+03 *
%   0.000497315917042
%   0.354630278436896
%   0.754594562645690
%   1.249097754855965
%   1.649180088144408
```