```
% Konstantin Zelmanovich
% Jayden Chen
% ECEC T480 - Numerical Methods
% Project 1
```

Bisection

```
clear all;
clc;
x = linspace(0, 100);
y = 50 * log(exp(1) + -2*((x/100).^2) + (3 - exp(1))*((x/100).^3));
y2 = 0.2 * (x.^2) / (2 * 9.8);
y3 = @(g) 50 * log(exp(1) + -2*((g/100).^2) + (3 -
 exp(1))*((g/100).^3)) - 0.2 * (g.^2) / (2 * 9.8);

%Original Pump
plot(x, y)
hold on

%Original Pump with a doubled output
plot(x, 2*y)
plot(2*x, y)
plot(x, y2)
title('Bisection method')
xlabel('Volumetric Flow Rate (m^3/s)')
ylabel('Head (m)')

% Pumps in series (doubled)
y4 = @(g) (50 * log(exp(1) + -2*((g/100).^2) + (3 -
 exp(1))*((g/100).^3))) *2 - 0.2 * (g.^2) / (2 * 9.8);

% Pumps in parallel
y5 = @(g) 50 * log(exp(1) + -2*((g*2/100).^2) + (3 -
 exp(1))*((g*2/100).^3)) - 0.2 * (g.^2) / (2 * 9.8);

fprintf('\n Bisection Approach of Original Pump: \n')
bisection(y3 ,0, 200, 50, 0.1)

fprintf('\n False Position Approach of Original Pump: \n')
false_position(y3 ,0, 200, 50, 0.1)

fprintf('\n Bisection Approach of Series Pump: \n')
bisection(y4 ,0, 200, 50, 0.1)

fprintf('\n False Position Approach of Series Pump: \n')
false_position(y4 ,0, 200, 50, 0.1)

fprintf('\n Bisection Approach of Parallel Pump: \n')
bisection(y5 ,0, 200, 50, 0.1)

fprintf('\n False Position Approach of Parallel Pump: \n')
false_position(y5 ,0, 200, 50, 0.1)
```

```
%Plotting Pump Original
x = 59.6;
y2 = 0.2 * (x.^2) / (2 * 9.8);
plot(x, y2, 'o')

% Plotting Pump in Series
x = 73.74;
y2 = 0.2 * (x.^2) / (2 * 9.8);
plot(x, y2, 'o')

% Plotting Pump in Parallel
x = 66.67;
y2 = 0.2 * (x.^2) / (2 * 9.8);
plot(x, y2, 'o')


legend({'x1 = 59.6','x2 = 73.74', 'x3 =
 66.67'},'Location','northeast')
```

Bisection Approach of Original Pump:

1 0.000000 200.000000 100.000000 -102.040816 1.000000

2 0.000000 100.000000 50.000000 15.113949 100.000000

3 50.000000 100.000000 75.000000 -30.511000 33.333333

4 50.000000 75.000000 62.500000 -5.057278 20.000000

5 50.000000 62.500000 56.250000 5.651243 11.111111

6 56.250000 62.500000 59.375000 0.456516 5.263158

7 59.375000 62.500000 60.937500 -2.259958 2.564103

8 59.375000 60.937500 60.156250 -0.891686 1.298701

9 59.375000 60.156250 59.765625 -0.215084 0.653595

10 59.375000 59.765625 59.570312 0.121340 0.327869

11 59.570312 59.765625 59.667969 -0.046716 0.163666

12 59.570312 59.667969 59.619141 0.037351 0.081900

False Position Approach of Original Pump:

1 0.000000 200.000000 21.550349 44.558051 1.000000

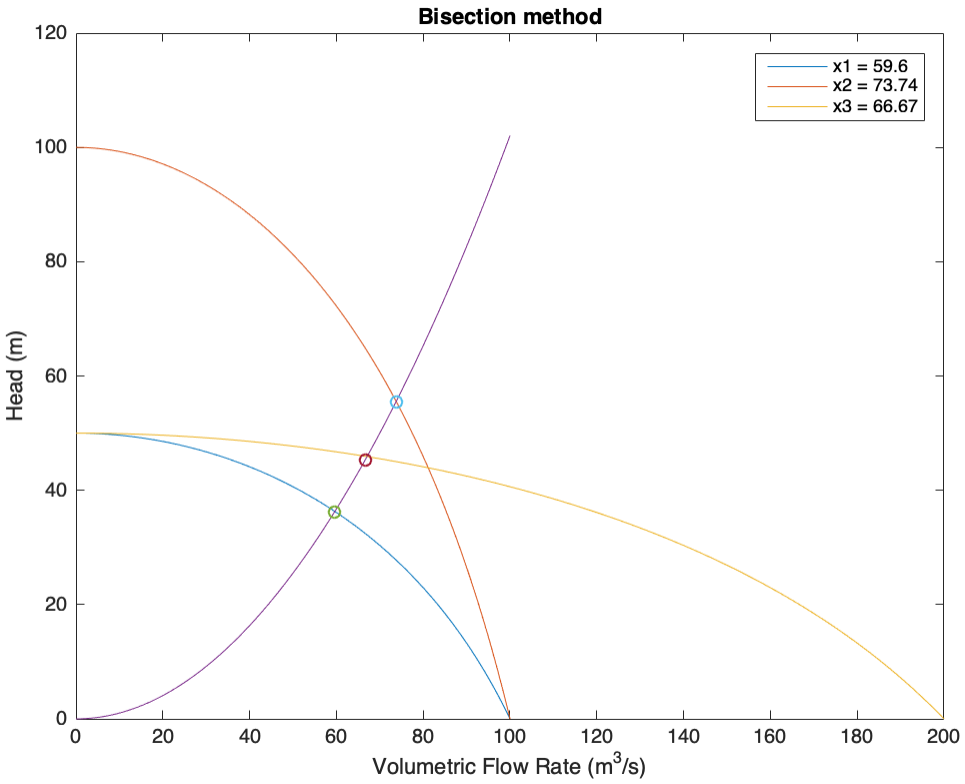
2 21.550349 200.000000 39.732786 30.398573 44.773627

3 39.732786 200.000000 52.502816 13.506310 23.859289

```
4 52.502816 200.000000 59.335793 1.419628 13.289748
5 52.502816 59.335793 58.756371 1.513051 13.401471
6 58.756371 59.335793 59.671541 -0.052804 1.657474
7 58.756371 59.671541 59.640316 0.000903 0.118412
8 59.640316 59.671541 59.640841 -0.000000 0.001108
ans =
  59.6408 + 0.0000i

 Bisection Approach of Series Pump:
1 0.000000 200.000000 100.000000 -102.040816 1.000000
2 0.000000 100.000000 50.000000 55.738101 100.000000
3 50.000000 100.000000 75.000000 -3.624040 33.333333
4 50.000000 75.000000 62.500000 29.745137 20.000000
5 62.500000 75.000000 68.750000 14.069812 9.090909
6 68.750000 75.000000 71.875000 5.489391 4.347826
7 71.875000 75.000000 73.437500 1.001347 2.127660
8 73.437500 75.000000 74.218750 -1.293903 1.052632
9 73.437500 74.218750 73.828125 -0.141952 0.529101
10 73.437500 73.828125 73.632812 0.430774 0.265252
11 73.632812 73.828125 73.730469 0.144681 0.132450
12 73.730469 73.828125 73.779297 0.001432 0.066181
 False Position Approach of Series Pump:
1 0.000000 200.000000 30.971996 93.960828 1.000000
2 30.971996 200.000000 61.676111 56.895408 45.636551
3 61.676111 200.000000 85.807772 -16.962850 28.495690
4 61.676111 85.807772 65.567050 22.410825 47.206274
5 65.567050 85.807772 72.251354 4.490257 10.637152
```

```
6 72.251354 85.807772 73.960754 -0.523867 2.714717
7 72.251354 73.960754 73.768779 0.032301 0.781178
8 73.768779 73.960754 73.779792 -0.000021 0.016417
ans =
  73.7798 + 0.0001i

 Bisection Approach of Parallel Pump:
1 0.000000 200.000000 100.000000 -46.646149 1.000000
2 0.000000 100.000000 50.000000 -25.510204 100.000000
3 0.000000 50.000000 25.000000 34.246602 100.000000
4 25.000000 50.000000 37.500000 12.537470 33.333333
5 37.500000 50.000000 43.750000 -3.580899 14.285714
6 37.500000 43.750000 40.625000 5.042225 7.692308
7 40.625000 43.750000 42.187500 0.886463 3.703704
8 42.187500 43.750000 42.968750 -1.306062 1.818182
9 42.187500 42.968750 42.578125 -0.199805 0.917431
10 42.187500 42.578125 42.382812 0.345792 0.460829
11 42.382812 42.578125 42.480469 0.073614 0.229885
12 42.480469 42.578125 42.529297 -0.062940 0.114811
13 42.480469 42.529297 42.504883 0.005376 0.057438
 False Position Approach of Parallel Pump:
1 0.000000 200.000000 24.370988 38.849412 1.000000
2 24.370988 200.000000 44.069823 5.879974 43.043834
3 24.370988 44.069823 38.210541 11.805606 46.781569
4 38.210541 44.069823 43.576818 -2.933661 13.934268
5 38.210541 43.576818 42.263763 0.675997 4.575431
6 42.263763 43.576818 42.501798 0.014008 0.562770
7 42.501798 43.576818 42.506961 -0.000437 0.022976
```

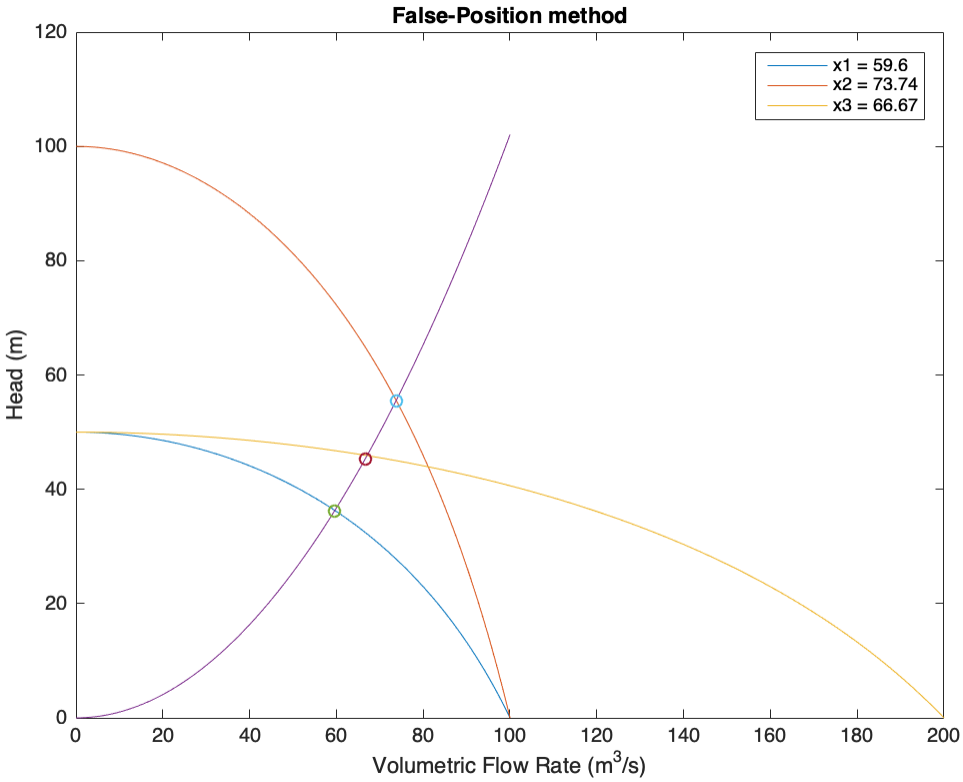
```
ans =

  42.5070 + 0.0004i
```



False-Position

```
clear all;
clc;
x = linspace(0, 100);
y = 50 * log(exp(1) + -2*((x/100).^2) + (3 - exp(1))*((x/100).^3));
y2 = 0.2 * (x.^2) / (2 * 9.8);
y3 = @(g) 50 * log(exp(1) + -2*((g/100).^2) + (3 -
 exp(1))*((g/100).^3)) - 0.2 * (g.^2) / (2 * 9.8);

%Original Pump
plot(x, y)
hold on

%Original Pump with a doubled output
plot(x, 2*y)
plot(2*x, y)
plot(x, y2)
title('False-Position method')
xlabel('Volumetric Flow Rate (m^3/s)')
```

```
ylabel('Head (m)')

%Plotting Pump Original
x = 59.6;
y2 = 0.2 * (x.^2) / (2 * 9.8);
plot(x, y2, 'o')

% Plotting Pump in Series
x = 73.74;
y2 = 0.2 * (x.^2) / (2 * 9.8);
plot(x, y2, 'o')

% Plotting Pump in Parallel
x = 66.67;
y2 = 0.2 * (x.^2) / (2 * 9.8);
plot(x, y2, 'o')

legend({'x1 = 59.6','x2 = 73.74', 'x3 =
 66.67'},'Location','northeast')
```



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