

Ques1)

Using a derivative based optimization

>> Find_minmax

interval[-3,-2.5]

maximum

x

x =

1.2857 -0.0048

fval

ans =

3.5925x

minimum

x =

-2.1364 -5.3198

fval

ans =

-2.1905e-09

interval[-2.5,-2]

maximum

x

x =

1.2857 -0.0048

fval

ans =

3.5925x

minimum

x =

-1.9226 -7.0580

fval

ans =

-7.2308e-17

interval[-2,-1.5]

maximum

x

x =

-0.0093 1.5814

```
fval
ans =
    8.1062x
minimum
```

```
x =
    0.2283 -1.6255
fval
ans =
    6.5511
```

```
interval[-1.5,-1]
-----
maximum
x
x =
   -0.4600 -0.6292
fval
ans =
    3.7766x
minimum
```

```
x =
   -1.3474  0.2045
fval
ans =
    3.0498
```

```
interval[-1,-0.5]
-----
maximum
    In Find_minmax (line 18)
x
x =
   -0.4600 -0.6292
fval
ans =
    3.7766x
minimum
x =
    0.2283 -1.6255
fval
ans =
    6.5511
```

interval[-0.5,0]

maximum

x

x =

-0.4600 -0.6292

fval

ans =

3.7766x

minimum

x =

-1.7677 5.3979

fval

ans =

-4.4609e-10

interval[0,0.5]

maximum

x

x =

-0.0093 1.5814

fval

ans =

8.1062x

minimum

x =

0.2964 0.3202

fval

ans =

0.0649

interval[0.5,1]

maximum

x

x =

-0.0093 1.5814

fval

ans =

8.1062x

minimum

x =

1.6705 -7.4359

```
fval
ans =
-7.1446e-20
```

```
interval[1,1.5]
```

```
-----
maximum
x
x =
-0.0093  1.5814
```

```
fval
ans =
8.1062
```

```
minimum
x =
1.8748  6.2332
```

```
fval
ans =
-3.7479e-14
```

```
interval[1.5,2]
```

```
-----
maximum
x
x =
-0.0093  1.5814
```

```
fval
ans =
8.1062
```

```
minimum
x =
2.1282  4.6740
```

```
fval
ans =
-7.8602e-08
```

```
interval[2,2.5]
```

```
-----
maximum
x
x =
-0.0093  1.5814
```

```
fval
ans =
```

```

    8.1062x
minimum
x =
    1.6676  10.5325
fval
ans =
    -5.3334e-44

interval[2.5,3]
-----
maximum
x
x =
    -0.0093  1.5814
fval
ans =
    8.1062x
minimum
x =
    2.1567  6.0655
fval
ans =
    -8.2589e-14
global max
globalmaxf =
    8.1062globalmaxx =
    -0.0093  1.5814
global min
globalminf =
    -6.5511globalminx =
    0.2283  -1.6255
>>

```

using genetic algorithm

```

>> ga_minmax
Optimization terminated: average change in the fitness value less than options.TolFun.
maximum
ans =
    -0.0093  1.5814  8.1062

minimum
ans =

```

-0.0093 1.5814 -8.1062

interval[-3,-2.5]

maximum

Optimization terminated: average change in the fitness value less than options.TolFun.

x =

-0.0093 1.5814

ans =

8.1062

minimum

Optimization terminated: average change in the fitness value less than options.TolFun.

x = 0.2283 -1.6255

fval =-6.5511

interval[-2.5,-2]

maximum

Optimization terminated: average change in the fitness value less than options.TolFun.

x = -0.0093 1.5814

ans =

8.1062

minimum

Optimization terminated: average change in the fitness value less than options.TolFun.

x =

0.2283 -1.6255

fval =

-6.5511

interval[-2,-1.5]

maximum

Optimization terminated: average change in the fitness value less than options.TolFun.

x =

-0.0093 1.5814

ans =
8.1062

minimum
Optimization terminated: average change in the fitness value less than options.TolFun.

x =
0.2283 -1.6255
fval =
-6.5511

interval[-1.5,-1]

maximum
Optimization terminated: average change in the fitness value less than options.TolFun.

x =
-0.0093 1.5814
ans =
8.1062

minimum
Optimization terminated: average change in the fitness value less than options.TolFun.

x =
0.2283 -1.6255
fval =
-6.5511

interval[-1,-0.5]

maximum
Optimization terminated: average change in the fitness value less than options.TolFun.

x =
-0.0093 1.5814
ans =
8.1062

minimum
Optimization terminated: average change in the fitness value less than options.TolFun.

```
x =  
    0.2283 -1.6255  
fval =  
    -6.5511
```

```
interval[-0.5,0]  
-----
```

```
maximum
```

```
Optimization terminated: average change in the fitness value less than options.TolFun.
```

```
x =  
    -0.0093  1.5814  
ans =  
    8.1062
```

```
minimum
```

```
Optimization terminated: average change in the fitness value less than options.TolFun.
```

```
x =  
    0.2283 -1.6255  
fval =  
    -6.5511
```

```
interval[0,0.5]  
-----
```

```
maximum
```

```
Optimization terminated: average change in the fitness value less than options.TolFun.
```

```
x =  
    -0.0093  1.5814  
ans =  
    8.1062
```

```
minimum
```

```
Optimization terminated: average change in the fitness value less than options.TolFun.
```

```
x =  
    0.2283 -1.6255  
fval =  
    -6.5511
```

```
interval[0.5,1]  
-----
```

```
maximum
```


Optimization terminated: average change in the fitness value less than options.TolFun.

```
x =  
-0.0093  1.5814  
ans =  
8.1062
```

minimum

Optimization terminated: average change in the fitness value less than options.TolFun.

```
x =  
0.2283 -1.6255  
fval =  
-6.5511
```

interval[1,1.5]

maximum

Optimization terminated: average change in the fitness value less than options.TolFun.

```
x =  
-0.0093  1.5814  
ans =  
8.1062
```

minimum

Optimization terminated: average change in the fitness value less than options.TolFun.

```
x =  
0.2283 -1.6255  
fval =  
-6.5511
```

interval[1.5,2]

maximum

Optimization terminated: average change in the fitness value less than options.TolFun.

```
x =  
-0.0093  1.5814  
ans =  
8.1062
```

minimum

Optimization terminated: average change in the fitness value less than options.TolFun.

x =
0.2283 -1.6255

fval =
-6.5511

interval[2,2.5]

maximum

Optimization terminated: average change in the fitness value less than options.TolFun.

x =
-0.0093 1.5814

ans =
8.1062

minimum

Optimization terminated: average change in the fitness value less than options.TolFun.

x =
0.2283 -1.6255

fval =
-6.5511

interval[2.5,3]

maximum

Optimization terminated: average change in the fitness value less than options.TolFun.

x =
-0.0093 1.5814

ans =
8.1062

minimum

Optimization terminated: average change in the fitness value less than options.TolFun.

x =
0.2283 -1.6255

fval =
-6.5511

global max

globalmaxf = 8.1062

globalmaxx = -0.0093 1.5814

global min
globalminf = -6.5511
globalminx = 0.2283 -1.6255

Conclusion: the derivative method takes fixed process to optimize whereas the genetic algorithm is more random in nature. May not give consistent results in each and every run.