FINDING THE LOCAL MINIMUM AND LOCAL MAXIMUM

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RESUME

- Description of problem
- Declaration of variables
- Definition of functions
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DESCRIPTION OF THE PROBLEM

- Searching for minimum and maximum of function $f(x, y) = \cos(x) + \sin(x + y)$
- Domain of function $(-2, 5) \times (-2, 5)$
- Accuracy 10^{-5}

DECLARATION OF VARIABLES

```
1
2     function abc1
3 -   cla;hold on;
4 -   x = linspace(-2,5,30);
5 -   y = linspace(-2,5,30);
6 -   [X,Y] = meshgrid(x,y);
7 -   surf(X,Y,f(X,Y), 'FaceAlpha',0.5);
8 -   pocetKroku=0;
9 -   acurracyy = 1e-5;
10
11
12 -  A = [0,0]; B=[2,0]; C=[1,2];
13 -  fa=f(A(1),A(2));
14 -  fb=f(B(1),B(2));
15 -  fc=f(C(1),C(2));
```

DEFINITION OF A FUNCTIONS

```
93      function z = f(x,y)
94 -      z = cos(x)+sin(x+y);
95
96      function z = fReverse(x,y)
97 -      z = -1.*(cos(x)+sin(x+y));
```

SEARCHING FOR MIN

```
17      %MIN
18 -    for k=1:120
19
20 -    if(fb>fa && fb>fc) %fb is the biggest
21 -        t=A; A=B;B=t;
22 -        t=fa; fa=fb;fb=t;
23 -    end
24 -     if(fc>fa && fc>fb) %fc is the biggest
25 -        t=A; A=C;C=t;
26 -        t=fa; fa=fc;fc=t;
27 -     end
28
29 -     S=(B+C)/2;
30 -     D=A+2*(S-A);
31 -     fd =f(D(1),D(2));
32 -     if(fd<fa) A=D; fa=fd;
33 -     else Sab=(A+B)/2; fSab=f(Sab(1),Sab(2));
34 -          Sac=(A+C)/2; fSac=f(Sac(1),Sac(2));
35 -          B=Sab; fb=fSab;
36 -          C=Sac;fc=fSac;
37 -     end
```

SEARCHING FOR MAX

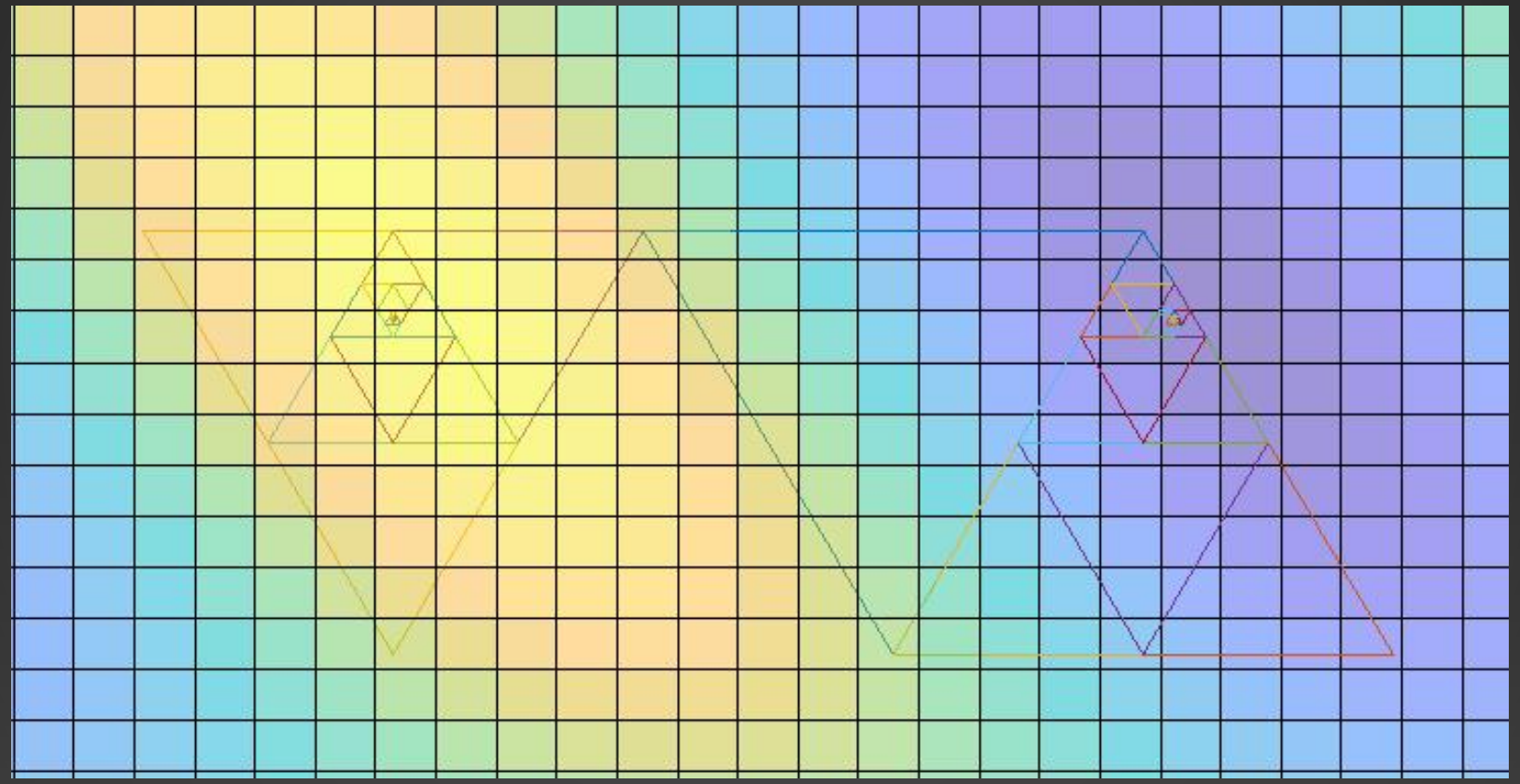
```
%MAX
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
A = [0,0]; B=[2,0]; C=[1,2];
fa=fReverse(A(1),A(2));
fb=fReverse(B(1),B(2));
fc=fReverse(C(1),C(2));
pocetKroku=0;

for k=1:120

if(fb>fa && fb>fc) %fb je nejvetsi
    t=A; A=B;B=t;
    t=fa; fa=fb;fb=t;
end
 if(fc>fa && fc>fb) %fc je nejvetsi
    t=A; A=C;C=t;
    t=fa; fa=fc;fc=t;
 end

 S=(B+C)/2;
 D=A+2*(S-A);
 fd =fReverse(D(1),D(2));
 if(fd<fa) A=D; fa=fd;
 else Sab=(A+B)/2; fSab=fReverse(Sab(1),Sab(2));
      Sac=(A+C)/2; fSac=fReverse(Sac(1),Sac(2));
      B=Sab; fb=fSab;
      C=Sac;fc=fSac;
 end
```

PLOTTING AND DISPLAYING THE RESULTS

```
39 -    plot3([A(1),B(1),C(1),A(1)],[A(2),B(2),C(2),A(2)], [0,0,0,0]);
40 -    if(sqrt((B(1)-A(1))^2+(B(2)-A(2))^2)<acurracyy) break;
41 -    end
42 -    pocetKroku=pocetKroku+1;
43 -  end
44      %[fa,fb,fc]
45      %print extreme
46 -    disp(['Local minimum of function(x,y,z) = ', num2str(A(1)), '; ', num2str(A(2)), '; ', num2str(f(A(1),A(2)))]);
```

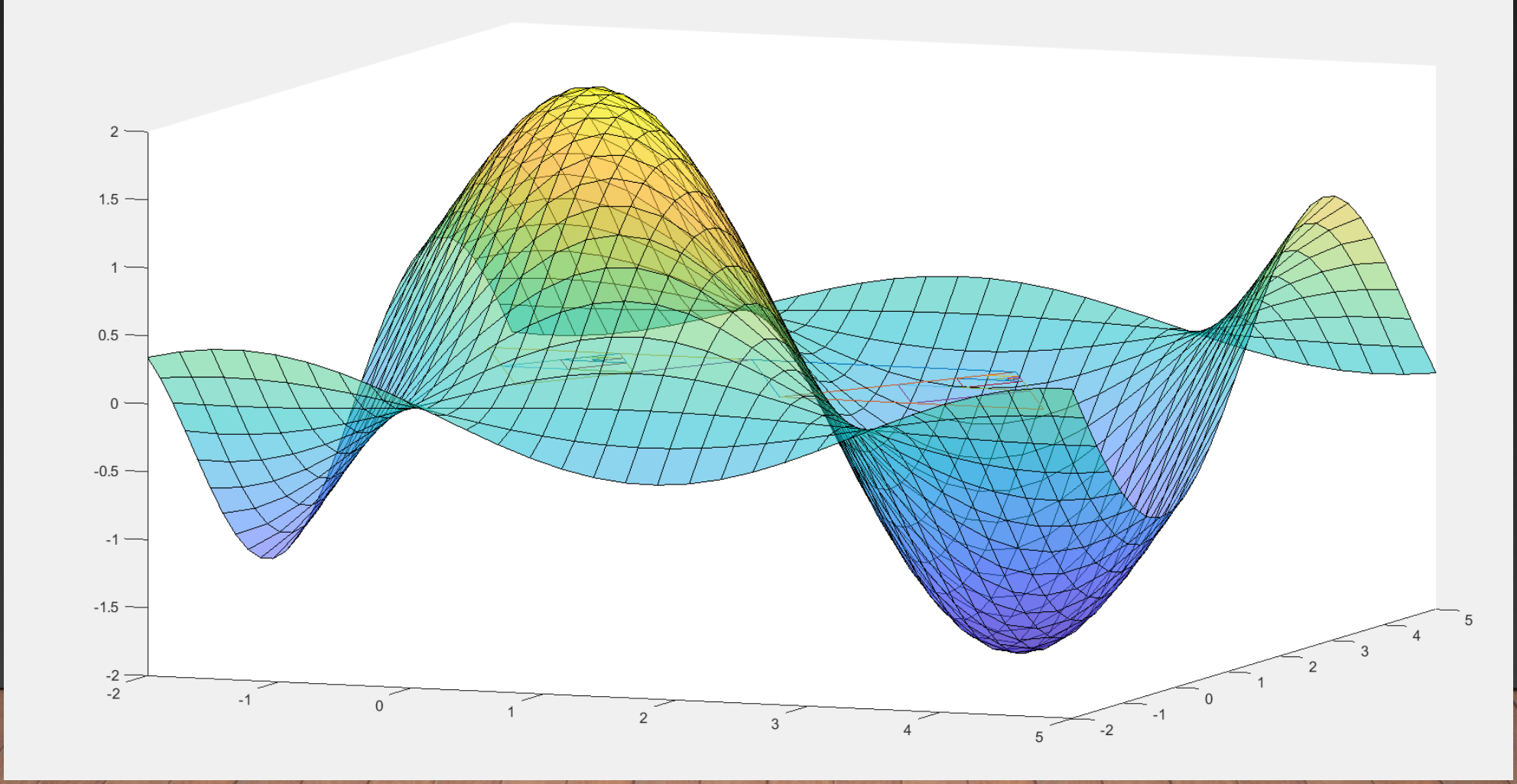
```
81 -    plot3([A(1),B(1),C(1),A(1)],[A(2),B(2),C(2),A(2)], [0,0,0,0]);
82 -    if(sqrt((B(1)-A(1))^2+(B(2)-A(2))^2)<acurracyy) break;
83 -    end
84 -    pocetKroku=pocetKroku+1;
85 -  end
86 -  pocetKroku
87    %[-1*fa,-1*fb,-1*fc]
88 -    disp(['Local maximum of function (x,y,z) = ', num2str(A(1)), '; ', num2str(A(2)), '; ', num2str(f(A(1),A(2)))]);
```

RESULTS

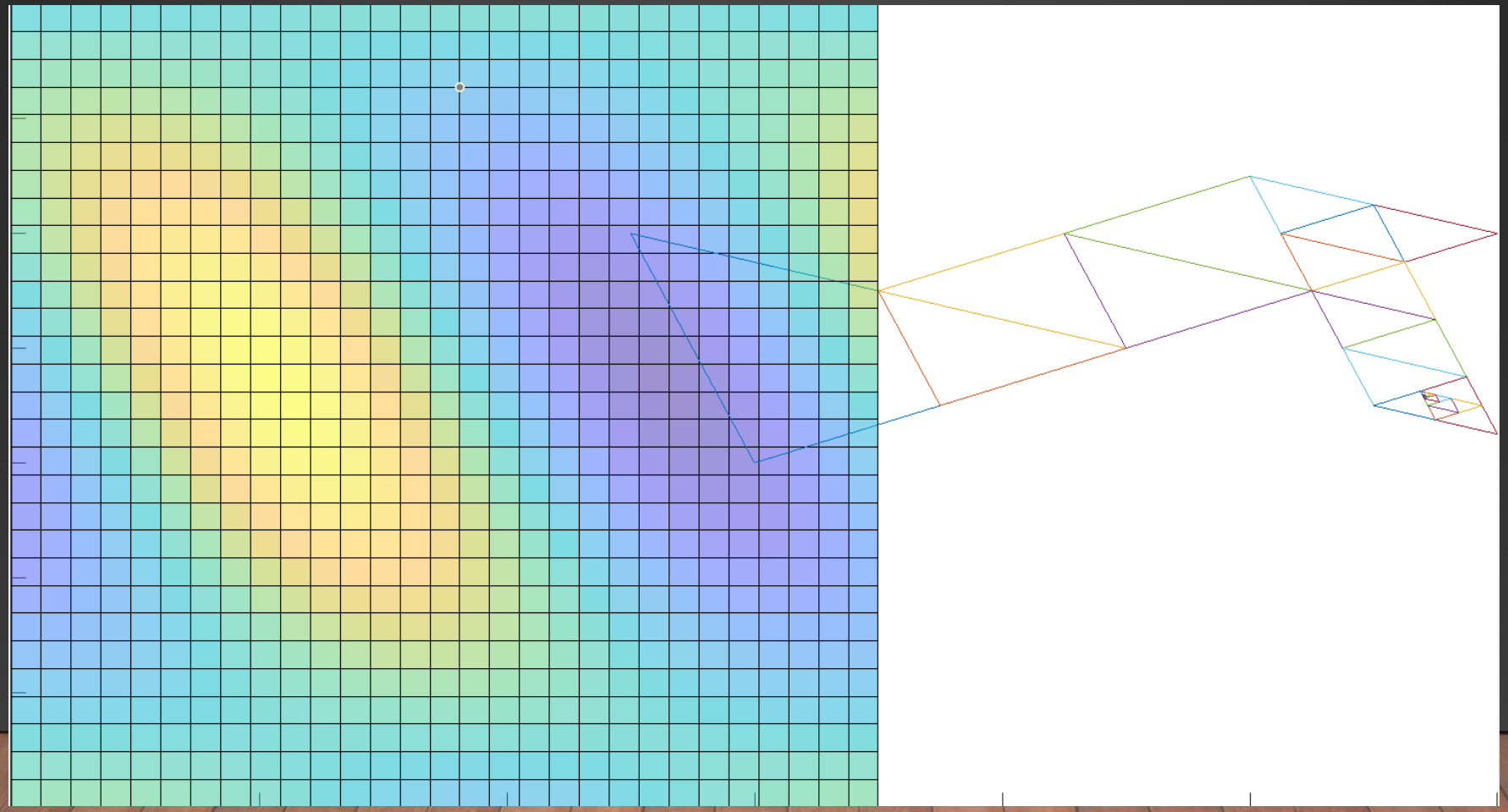


```
Local minimum of function(x,y,z) = 3.1416; 1.5708; -2
Local maximum of function (x,y,z) = -7.6294e-06; 1.5708; 2
```

RESULTS



PROBLEMS AND FAIL RESULTS



SUMMARY

- We declared variables and basic triangle
- Found the smallest triangle and the minimum and maximum of the function
- Displayed the graph and results
- Shown where can be done a mistake

THANK YOU FOR YOUR ATTENTION