SCS 2111 Laboratory II

Takehome Assignment 3 (Octave)

Name: D.T.A.H.N.Dissanayake

Index No: 13000332

1) Linear system of equations

i.

```
>>
>> A=[1 4;-3 1];
>> B=[34;2];
>> A\B
ans =

   2
   8
```

Answers are x=2 and y=8

ii.

```
>>
>> A=[2 -2;-1 1;3 4];
>> B=[4;3;2];
>> A\B
ans =

   0.85714
  -0.14286
```

This is incorrect

iii.

```
>>
>> A=[3 6 4;1 5 0;0 7 7];
>> B=[1;2;3];
>> A\B
ans =

  -0.582418
   0.516484
  -0.087912
```

This is correct. Answers are a=-0.582418, b=0.516484 and c=-0.087912

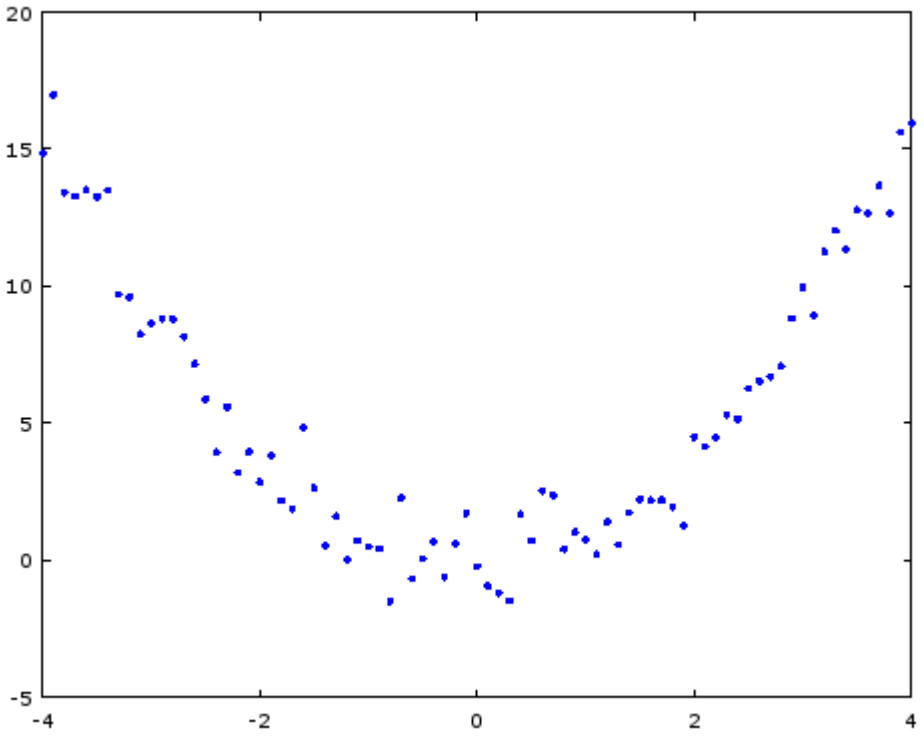
2) Polynomial fitting

i.

```
>>
>> x=(-4:0.1:4);
>> y=x.^2;
```

ii.

```
>> y=y+randn(size(y));
>> plot(x,y,'.');
```

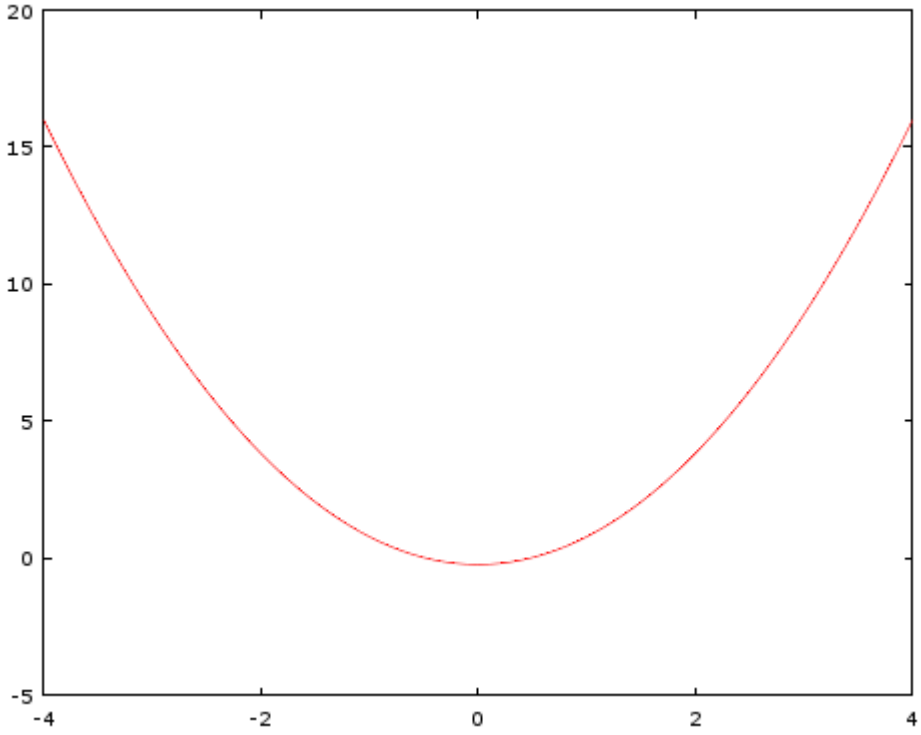


iii.

```
>>
>> p=polyfit(x,y,2);
>>
```

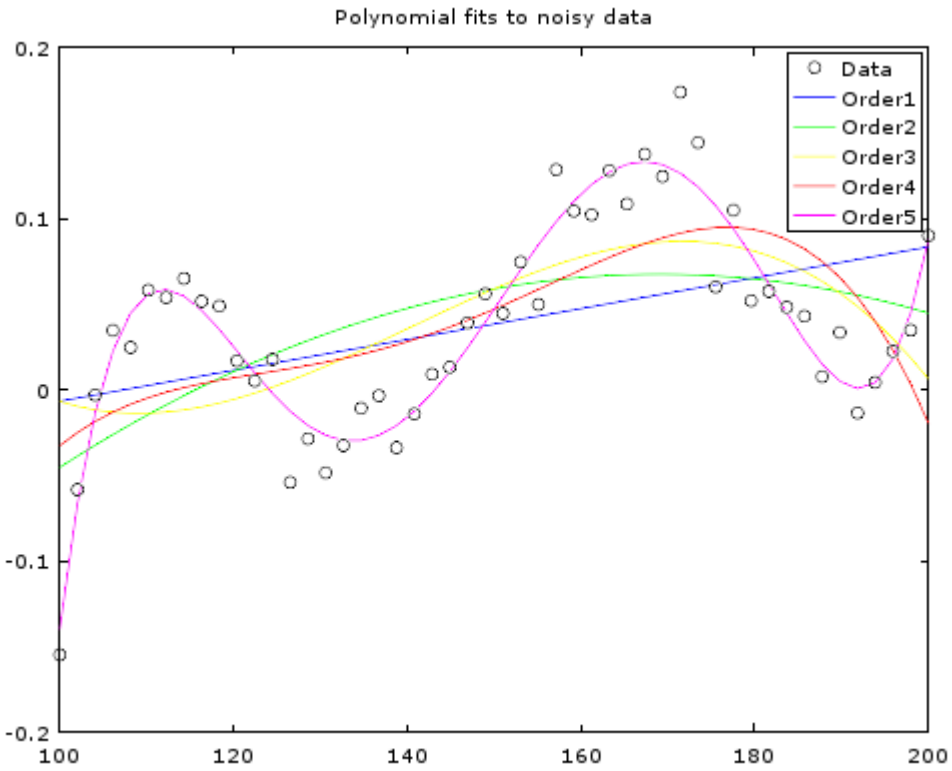
iv.

```
>> hold on;
>> plot(x,polyval(p,x),'r');
>>
```



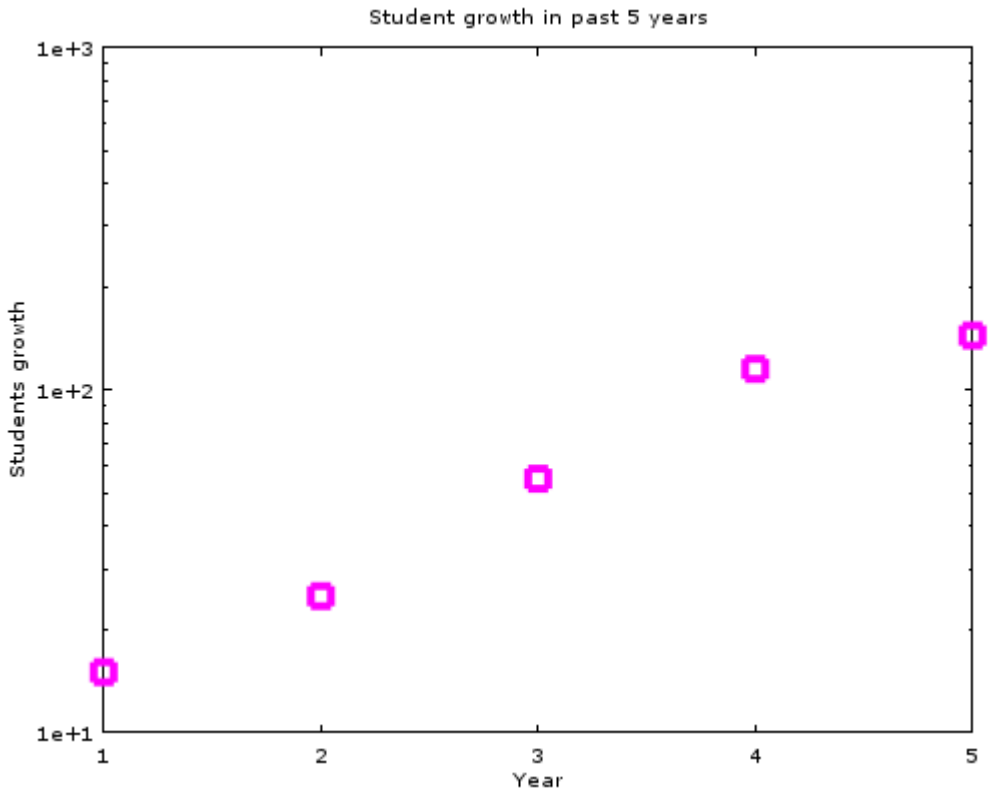
3) Polynomial fitting

```
>> load randomData.mat
>> p=polyval(polyfit(x,y,1),x);
>> q=polyval(polyfit(x,y,2),x);
>> r=polyval(polyfit(x,y,3),x);
>> s=polyval(polyfit(x,y,4),x);
>> t=polyval(polyfit(x,y,5),x);
>> plot(x,y,'ok',x,p,'-b',x,q,'-g',x,r,'-y',x,s,'-r',x,t,'-m');
>> title("Polynomial fits to noisy data");
>> legend("Data","Order1","Order2","Order3","Order4","Order5");
>>
```



4) Semilog plot

```
>> x=[15,25,55,115,144];
>> semilogy(x,"sm","linewidth",4,"markersize",10);
>> xlabel("Year");
>> ylabel("Students growth");
>> title("Student growth in past 5 years");
```



5) Interpolation and surface plot

a.

```
>> z0=rand(5,5);
>> z0
z0 =

   0.46197   0.76440   0.55602   0.80517   0.99789
   0.17635   0.15493   0.38317   0.24988   0.33112
   0.23254   0.80247   0.80107   0.19187   0.40350
   0.63027   0.85906   0.43550   0.54575   0.12450
   0.43492   0.48807   0.28925   0.11998   0.43708
```

b.

```
>> p=[1:5];
>> [X0,Y0]=meshgrid(p,p);
>> X0
X0 =

   1   2   3   4   5
   1   2   3   4   5
   1   2   3   4   5
   1   2   3   4   5
   1   2   3   4   5

>> Y0
Y0 =

   1   1   1   1   1
   2   2   2   2   2
   3   3   3   3   3
   4   4   4   4   4
   5   5   5   5   5
```

c.

```
>>
>> q=[1:0.1:5];
>> [X1,Y1]=meshgrid(q,q);
>> X1
X1 =
```

```
 Columns 1 through 11:

   1.0000   1.1000   1.2000   1.3000   1.4000   1.5000   1.6000   1.7000   1.8000   1.9000   2.0000
   1.0000   1.1000   1.2000   1.3000   1.4000   1.5000   1.6000   1.7000   1.8000   1.9000   2.0000
   1.0000   1.1000   1.2000   1.3000   1.4000   1.5000   1.6000   1.7000   1.8000   1.9000   2.0000
   1.0000   1.1000   1.2000   1.3000   1.4000   1.5000   1.6000   1.7000   1.8000   1.9000   2.0000
   1.0000   1.1000   1.2000   1.3000   1.4000   1.5000   1.6000   1.7000   1.8000   1.9000   2.0000
   1.0000   1.1000   1.2000   1.3000   1.4000   1.5000   1.6000   1.7000   1.8000   1.9000   2.0000
   1.0000   1.1000   1.2000   1.3000   1.4000   1.5000   1.6000   1.7000   1.8000   1.9000   2.0000
   1.0000   1.1000   1.2000   1.3000   1.4000   1.5000   1.6000   1.7000   1.8000   1.9000   2.0000
   1.0000   1.1000   1.2000   1.3000   1.4000   1.5000   1.6000   1.7000   1.8000   1.9000   2.0000
   1.0000   1.1000   1.2000   1.3000   1.4000   1.5000   1.6000   1.7000   1.8000   1.9000   2.0000
   1.0000   1.1000   1.2000   1.3000   1.4000   1.5000   1.6000   1.7000   1.8000   1.9000   2.0000
   1.0000   1.1000   1.2000   1.3000   1.4000   1.5000   1.6000   1.7000   1.8000   1.9000   2.0000
   1.0000   1.1000   1.2000   1.3000   1.4000   1.5000   1.6000   1.7000   1.8000   1.9000   2.0000
   1.0000   1.1000   1.2000   1.3000   1.4000   1.5000   1.6000   1.7000   1.8000   1.9000   2.0000
   1.0000   1.1000   1.2000   1.3000   1.4000   1.5000   1.6000   1.7000   1.8000   1.9000   2.0000
   1.0000   1.1000   1.2000   1.3000   1.4000   1.5000   1.6000   1.7000   1.8000   1.9000   2.0000
   1.0000   1.1000   1.2000   1.3000   1.4000   1.5000   1.6000   1.7000   1.8000   1.9000   2.0000
   1.0000   1.1000   1.2000   1.3000   1.4000   1.5000   1.6000   1.7000   1.8000   1.9000   2.0000
   1.0000   1.1000   1.2000   1.3000   1.4000   1.5000   1.6000   1.7000   1.8000   1.9000   2.0000
   1.0000   1.1000   1.2000   1.3000   1.4000   1.5000   1.6000   1.7000   1.8000   1.9000   2.0000
   1.0000   1.1000   1.2000   1.3000   1.4000   1.5000   1.6000   1.7000   1.8000   1.9000   2.0000
   1.0000   1.1000   1.2000   1.3000   1.4000   1.5000   1.6000   1.7000   1.8000   1.9000   2.0000
   1.0000   1.1000   1.2000   1.3000   1.4000   1.5000   1.6000   1.7000   1.8000   1.9000   2.0000
   1.0000   1.1000   1.2000   1.3000   1.4000   1.5000   1.6000   1.7000   1.8000   1.9000   2.0000
   1.0000   1.1000   1.2000   1.3000   1.4000   1.5000   1.6000   1.7000   1.8000   1.9000   2.0000
   1.0000   1.1000   1.2000   1.3000   1.4000   1.5000   1.6000   1.7000   1.8000   1.9000   2.0000
   1.0000   1.1000   1.2000   1.3000   1.4000   1.5000   1.6000   1.7000   1.8000   1.9000   2.0000
   1.0000   1.1000   1.2000   1.3000   1.4000   1.5000   1.6000   1.7000   1.8000   1.9000   2.0000
   1.0000   1.1000   1.2000   1.3000   1.4000   1.5000   1.6000   1.7000   1.8000   1.9000   2.0000
   1.0000   1.1000   1.2000   1.3000   1.4000   1.5000   1.6000   1.7000   1.8000   1.9000   2.0000
>>
>> Y1
Y1 =

 Columns 1 through 11:

   1.0000   1.0000   1.0000   1.0000   1.0000   1.0000   1.0000   1.0000   1.0000   1.0000   1.0000
   1.1000   1.1000   1.1000   1.1000   1.1000   1.1000   1.1000   1.1000   1.1000   1.1000   1.1000
   1.2000   1.2000   1.2000   1.2000   1.2000   1.2000   1.2000   1.2000   1.2000   1.2000   1.2000
   1.3000   1.3000   1.3000   1.3000   1.3000   1.3000   1.3000   1.3000   1.3000   1.3000   1.3000
   1.4000   1.4000   1.4000   1.4000   1.4000   1.4000   1.4000   1.4000   1.4000   1.4000   1.4000
   1.5000   1.5000   1.5000   1.5000   1.5000   1.5000   1.5000   1.5000   1.5000   1.5000   1.5000
   1.6000   1.6000   1.6000   1.6000   1.6000   1.6000   1.6000   1.6000   1.6000   1.6000   1.6000
   1.7000   1.7000   1.7000   1.7000   1.7000   1.7000   1.7000   1.7000   1.7000   1.7000   1.7000
   1.8000   1.8000   1.8000   1.8000   1.8000   1.8000   1.8000   1.8000   1.8000   1.8000   1.8000
   1.9000   1.9000   1.9000   1.9000   1.9000   1.9000   1.9000   1.9000   1.9000   1.9000   1.9000
   2.0000   2.0000   2.0000   2.0000   2.0000   2.0000   2.0000   2.0000   2.0000   2.0000   2.0000
   2.1000   2.1000   2.1000   2.1000   2.1000   2.1000   2.1000   2.1000   2.1000   2.1000   2.1000
   2.2000   2.2000   2.2000   2.2000   2.2000   2.2000   2.2000   2.2000   2.2000   2.2000   2.2000
   2.3000   2.3000   2.3000   2.3000   2.3000   2.3000   2.3000   2.3000   2.3000   2.3000   2.3000
   2.4000   2.4000   2.4000   2.4000   2.4000   2.4000   2.4000   2.4000   2.4000   2.4000   2.4000
   2.5000   2.5000   2.5000   2.5000   2.5000   2.5000   2.5000   2.5000   2.5000   2.5000   2.5000
   2.6000   2.6000   2.6000   2.6000   2.6000   2.6000   2.6000   2.6000   2.6000   2.6000   2.6000
   2.7000   2.7000   2.7000   2.7000   2.7000   2.7000   2.7000   2.7000   2.7000   2.7000   2.7000
   2.8000   2.8000   2.8000   2.8000   2.8000   2.8000   2.8000   2.8000   2.8000   2.8000   2.8000
   2.9000   2.9000   2.9000   2.9000   2.9000   2.9000   2.9000   2.9000   2.9000   2.9000   2.9000
   3.0000   3.0000   3.0000   3.0000   3.0000   3.0000   3.0000   3.0000   3.0000   3.0000   3.0000
   3.1000   3.1000   3.1000   3.1000   3.1000   3.1000   3.1000   3.1000   3.1000   3.1000   3.1000
   3.2000   3.2000   3.2000   3.2000   3.2000   3.2000   3.2000   3.2000   3.2000   3.2000   3.2000
   3.3000   3.3000   3.3000   3.3000   3.3000   3.3000   3.3000   3.3000   3.3000   3.3000   3.3000
   3.4000   3.4000   3.4000   3.4000   3.4000   3.4000   3.4000   3.4000   3.4000   3.4000   3.4000
   3.5000   3.5000   3.5000   3.5000   3.5000   3.5000   3.5000   3.5000   3.5000   3.5000   3.5000
   3.6000   3.6000   3.6000   3.6000   3.6000   3.6000   3.6000   3.6000   3.6000   3.6000   3.6000
   3.7000   3.7000   3.7000   3.7000   3.7000   3.7000   3.7000   3.7000   3.7000   3.7000   3.7000
   3.8000   3.8000   3.8000   3.8000   3.8000   3.8000   3.8000   3.8000   3.8000   3.8000   3.8000
   3.9000   3.9000   3.9000   3.9000   3.9000   3.9000   3.9000   3.9000   3.9000   3.9000   3.9000
```

d.

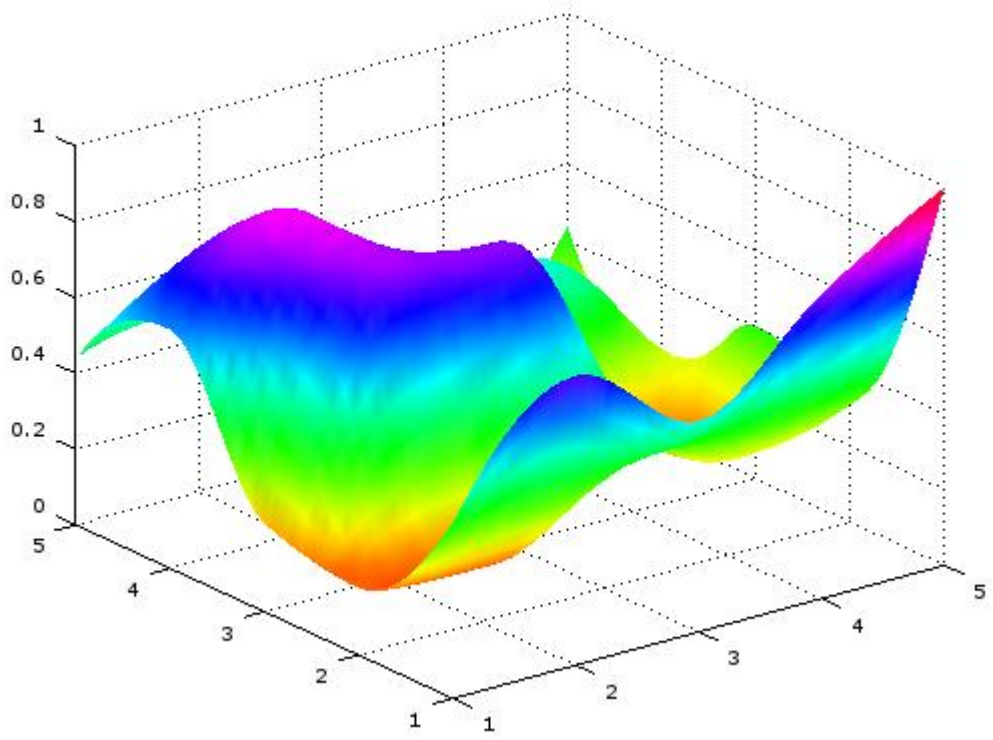
```
>> z1=interp2(X0,Y0,z0,X1,Y1,"cubic");
>> z1
z1 =

 Columns 1 through 10:
```

0.46197	0.51563	0.56483	0.60930	0.64876	0.68292	0.71150	0.73422	0.75080	0.76096
0.41700	0.45754	0.49481	0.52857	0.55860	0.58465	0.60649	0.62389	0.63661	0.64441
0.37383	0.40321	0.43034	0.45502	0.47705	0.49624	0.51238	0.52529	0.53475	0.54057
0.33317	0.35320	0.37185	0.38895	0.40432	0.41780	0.42922	0.43839	0.44516	0.44934
0.29569	0.30806	0.31977	0.33068	0.34062	0.34946	0.35702	0.36317	0.36775	0.37062
0.26209	0.26835	0.27454	0.28052	0.28616	0.29131	0.29584	0.29960	0.30247	0.30429
0.23306	0.23462	0.23657	0.23878	0.24113	0.24348	0.24570	0.24766	0.24922	0.25025
0.20928	0.20742	0.20629	0.20578	0.20575	0.20608	0.20664	0.20730	0.20793	0.20840
0.19144	0.18730	0.18414	0.18182	0.18023	0.17923	0.17870	0.17851	0.17853	0.17864
0.18024	0.17483	0.17053	0.16722	0.16476	0.16303	0.16191	0.16126	0.16095	0.16086
0.17635	0.17055	0.16590	0.16228	0.15956	0.15761	0.15630	0.15551	0.15511	0.15496
0.17704	0.17377	0.17159	0.17031	0.16975	0.16976	0.17015	0.17076	0.17140	0.17192
0.17904	0.18268	0.18718	0.19224	0.19757	0.20289	0.20789	0.21229	0.21579	0.21811
0.18228	0.19610	0.21044	0.22485	0.23886	0.25200	0.26380	0.27379	0.28151	0.28648
0.18667	0.21284	0.23916	0.26493	0.28947	0.31211	0.33217	0.34895	0.36179	0.36999
0.19213	0.23176	0.27110	0.30923	0.34525	0.37824	0.40728	0.43146	0.44987	0.46158
0.19858	0.25166	0.30404	0.35455	0.40204	0.44539	0.48342	0.51500	0.53898	0.55421
0.20593	0.27139	0.33575	0.39764	0.45570	0.50857	0.55488	0.59327	0.62238	0.64084
0.21409	0.28977	0.36402	0.43531	0.50208	0.56280	0.61593	0.65994	0.69328	0.71441
0.22299	0.30563	0.38662	0.46430	0.53701	0.60309	0.66088	0.70871	0.74493	0.76788
0.23254	0.31780	0.40133	0.48141	0.55636	0.62445	0.68399	0.73326	0.77057	0.79421
0.25165	0.33615	0.41870	0.49765	0.57138	0.63824	0.69661	0.74485	0.78134	0.80442
0.28650	0.36879	0.44851	0.52424	0.59453	0.65795	0.71306	0.75842	0.79261	0.81417
0.33292	0.41185	0.48736	0.55828	0.62347	0.68179	0.73208	0.77319	0.80398	0.82330
0.38672	0.46149	0.53181	0.59687	0.65585	0.70797	0.75241	0.78838	0.81506	0.83167
0.44371	0.51385	0.57846	0.63709	0.68932	0.73470	0.77281	0.80321	0.82545	0.83912
0.49972	0.56508	0.62389	0.67606	0.72152	0.76020	0.79201	0.81689	0.83475	0.84553
0.55056	0.61133	0.66468	0.71087	0.75012	0.78267	0.80877	0.82865	0.84256	0.85073
0.59205	0.64874	0.69743	0.73861	0.77275	0.80033	0.82182	0.83771	0.84847	0.85458
0.62002	0.67345	0.71870	0.75637	0.78706	0.81138	0.82992	0.84329	0.85209	0.85693

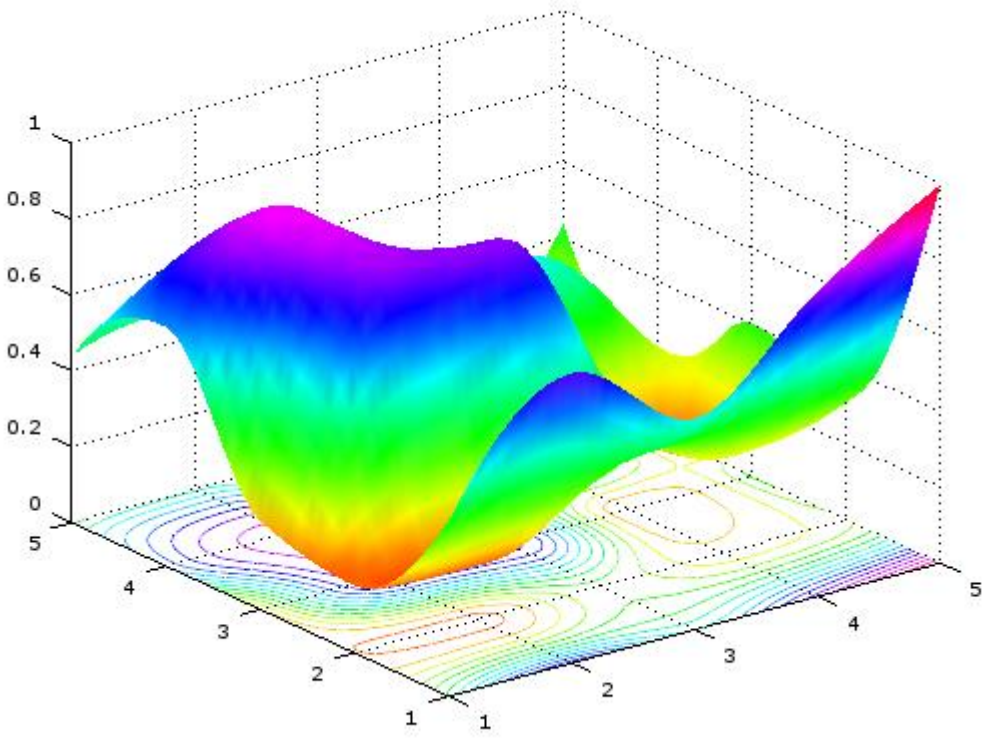
e.

```
>> surf(X1,Y1,z1);
>> colormap("hsv");
>> shading interp;
```



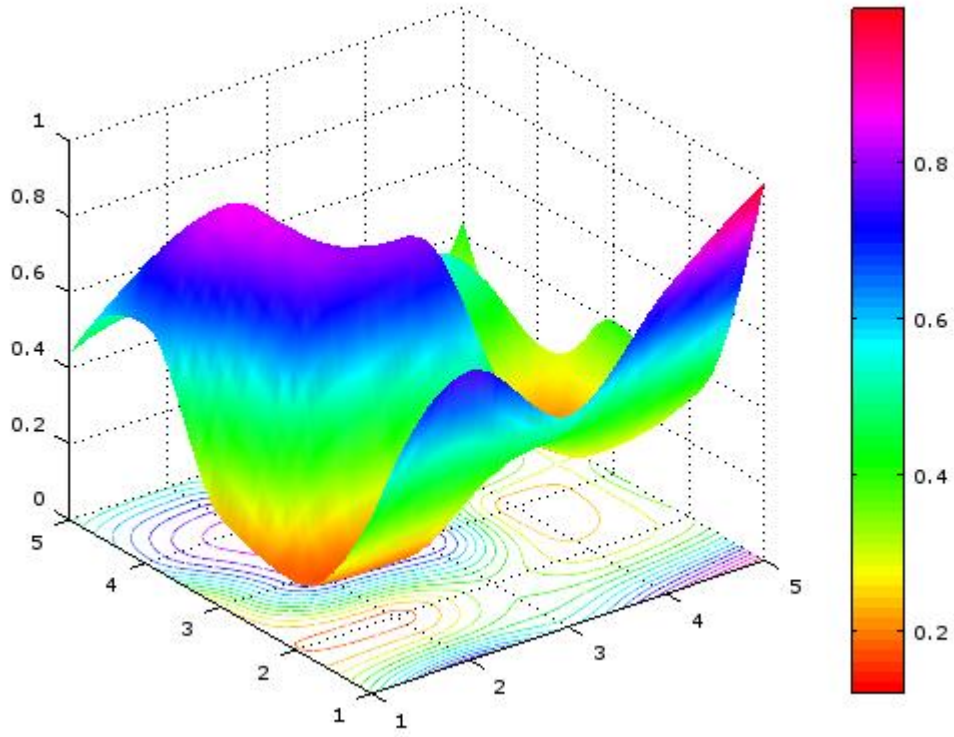
f.

```
>> hold on;
>> contour(X1,Y1,z1,15);
```



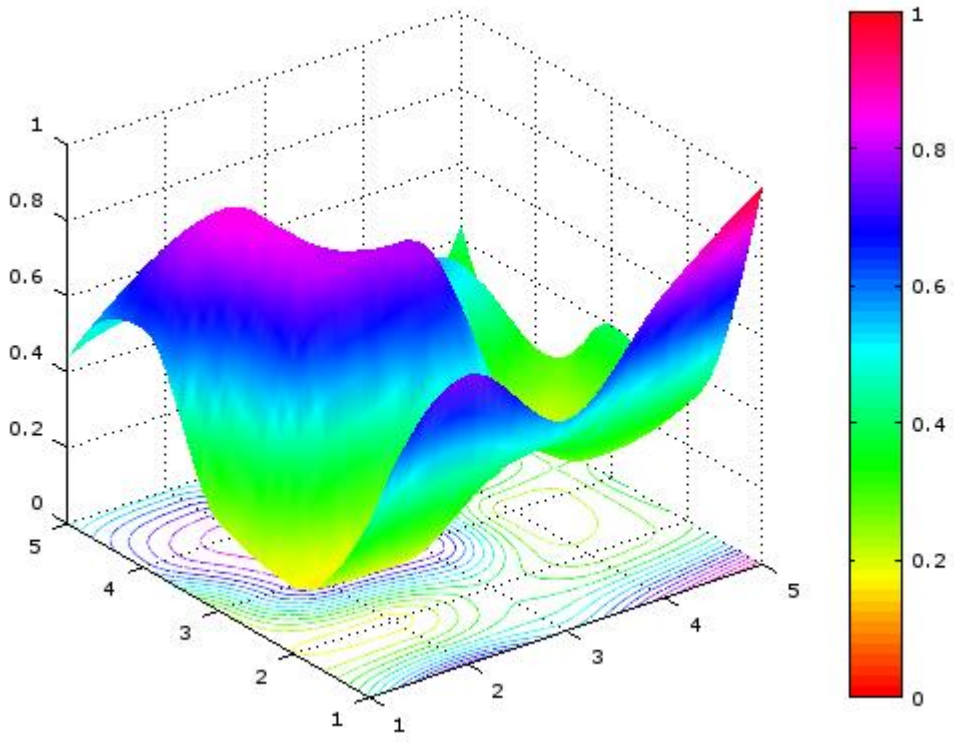
g.

```
>>
>> colorbar("location","EastOutside");
>>
```



h.

```
>>
>> caxis([0 1]);
```



6) Loop and for controls

```
>> function loopTest(N)
for n=1:N
if ((mod(n,2)==0) && (mod(n,3)==0))
display(strcat((num2str(n))," is divisible by 2 AND 3"));
elseif (mod(n,2)==0)
display(strcat((num2str(n))," is divisible by 2"));
elseif (mod(n,3)==0)
display(strcat((num2str(n))," is divisible by 3"));
else
display(strcat((num2str(n))," is NOT divisible by 2 or 3"));
end
end
endfunction
```

```
>> loopTest(10)
1 is NOT divisible by 2 or 3

2 is divisible by 2

3 is divisible by 3

4 is divisible by 2

5 is NOT divisible by 2 or 3

6 is divisible by 2 AND 3

7 is NOT divisible by 2 or 3

8 is divisible by 2

9 is divisible by 3

10 is divisible by 2
```