Department of Mathematics

School of Advanced Sciences

MAT 1011 – Calculus for Engineers (MATLAB)

Experiment 3-A

Plotting 3D curves and surfaces, Taylor series of function of two variables

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Question 1:

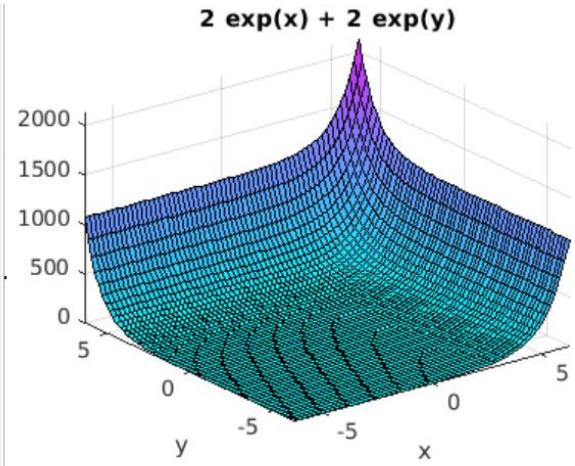
Draw the surface of the function f(x,y)=e^x+e^y using ezsurf.

CODES:

```
clear
clc
syms x y
f=2*(exp(x)+exp(y));
ezsurf(f)
colormap cool
```

OUTPUT:

```
clear
clc
syms x y
f=2*(exp(x)+exp(y));
ezsurf(f)
colormap cool
```



Question 2:

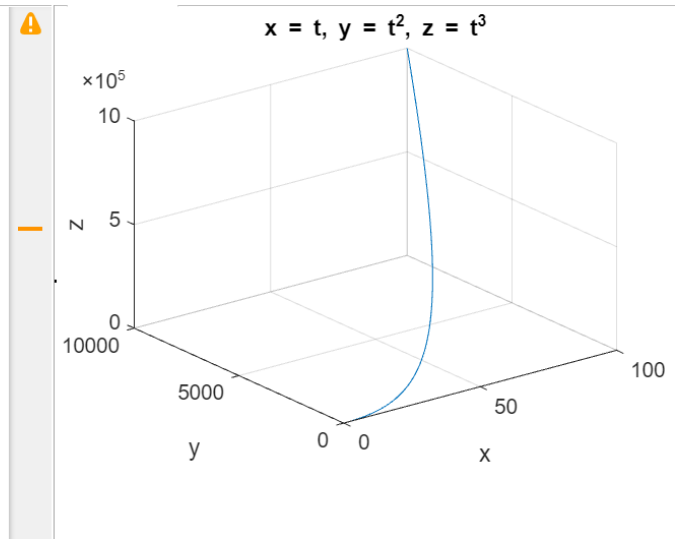
Draw the 3D-plot of the function f(t)=(t,t^2,t^3), where $0 \leq t \leq 100.$

CODES:

```
clear
close all
clc
syms t
x=t;
y=t^2;
z=t^3;
ezplot3(x,y,z,[0,100])
```

OUTPUT:

```
clear
close all
clc
syms t
x=t;
y=t^2;
z=t^3;
ezplot3(x,y,z,[0,100])
```



Question 3:

Using surf, plot the surface of

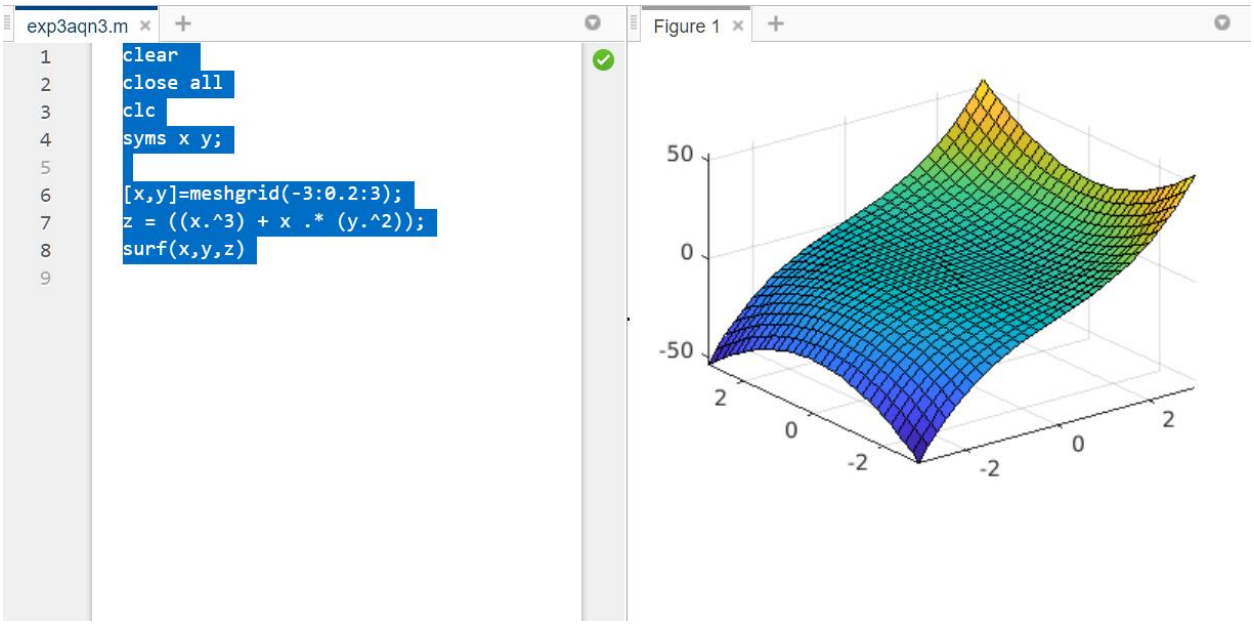
$$f(x,y) = x(x^2 + y^2).$$

CODES:

```
clear
close all
clc
syms x y;

[x,y]=meshgrid(-3:0.2:3);
z = ((x.^3) + x .* (y.^2));
surf(x,y,z)
```

OUTPUT:



Question 4:

Expand $f(x,y) = e^x \ln(1+y)$ in terms of x and y upto the terms of 3rd degree using Taylor series.

CODES:

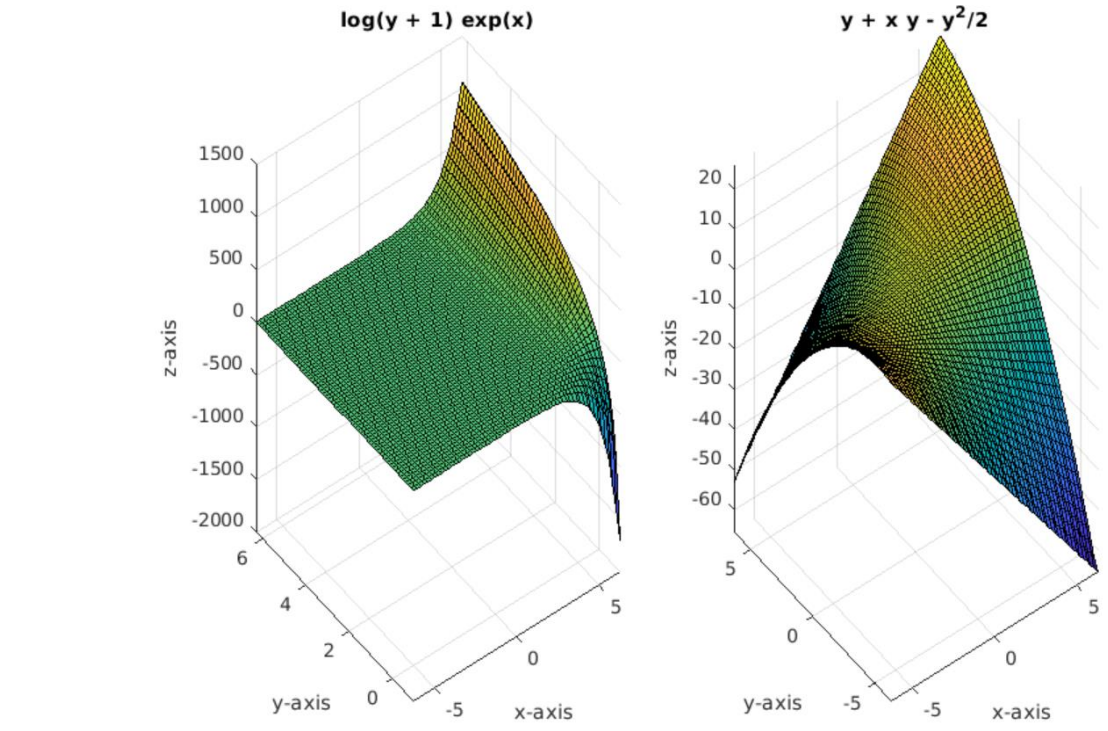
```
clear
close all
clc
syms x y;
f=input('Enter the function to be
approximated');
Neighbourhood=input('Enter the points[a,b] of
approximation');
a=Neighbourhood(1);
b=Neighbourhood(2);
n=input('Enter the order for approximation');
expansion=taylor(f,[x,y],[a,b],'order',n);
disp('The Taylors expansion of the given
function is:')
disp(expansion)
subplot(1,2,1);
ezsurf(f);
subplot(1,2,2);
ezsurf(expansion);
```

INPUT:

```
Enter the function to be approximated
exp(x)*log(1+y)
Enter the points[a,b] of approximation
[0,0]
Enter the order for approximation
3
```

OUTPUT:

```
The Taylors expansion of the given function is:
y + x*y - y^2/2
```



Question 5:

Expand $e^{(x*y)}$ in Taylor series the neighbouhood of (1,1).

CODE:

```
clear all
close all
clc
syms x y;
f=exp(y*x);
neighbourhood=[1,1];
a=neighbourhood(1)
b=neighbourhood(2)

n=input('Enter the order of expansion');

expan=taylor(f,[x,y],[a,b],'order',n);
disp('The taylors expansion about the point is
')
disp(expan)
subplot(1,2,1)
```

```
ezsurf(expan);
subplot(1,2,2)
ezsurf(f);
```

INPUT

```
a =

     1


b =

     1

Enter the order of expansion
3
```

OUTPUT:

```
 The taylors expansion about the point is
exp(1) + exp(1)*(x - 1) + exp(1)*(y - 1) +
```

(exp(1)*(x - 1)^2)/2 + (exp(1)*(y - 1)^2)/2 + 2*exp(1)*(x - 1)*(y - 1)

```
clear all
close all
clc
syms x y;
f=exp(y*x);
neighbourhood=[1,1];
a=neighbourhood(1)
b=neighbourhood(2)

n=input('Enter the order of expansion');

expan=taylor(f,[x,y],[a,b],'order',n);
disp('The taylors expansion about the point is ')
disp(expan)
subplot(1,2,1)
ezsurf(expan);
subplot(1,2,2)
ezsurf(f);
```

Command Window

```
Enter the order of expansion
3
The taylors expansion about the point is
exp(1) + exp(1)*(x - 1) + exp(1)*(y - 1) + (exp(1)*(x - 1)^2)/2 + (exp(1)*(y - 1)^2)/2 + 2*exp(1)*(x - 1)*(y - 1)
```