Matlab-6

Taylor Series

Name: Om Ashish Mishra

Registration Number: 16BCE0789

TAYLOR SERIES

Experiment 6 (19/09/2016)

Aim:

(1) Find Taylor series of the function ln(x) around x = 2
(2) Find series expansion of $e^x \sin(y)$ around the origin.
(3) Take any problem on piece-wise continuous function and find the Laplace transform for it.

New Commends:

taylor(f): Returns the Taylor series expansion of f up to fifth order. The default expansion point is 0.

taylor(f,x): Returns the Taylor series expansion of f with respect to x up to fifth order. The default expansion point is 0.

taylor(f,x,a): Returns fifth order Taylor polynomial approximation of f with respect to x about the point a. x and a can be vectors.

taylor(f,x,a,'Order',n): Compute the Taylor series approximation with order n−1, where n has to be a positive integer. The default value n = 6 is used.

For part 1:

The code:

```
clc
clearvars
close all
syms x
f = input('Enter the function f(x): ');
a = input('Enter the point around which Taylor series is sought: ');
n = input('Enter the number of terms: ');
range = input('Enter the range in the form [x0 x1 y0 y1] for plotting: ');
tayser = taylor(f,x,a,'Order',n);
ezplot(f,range);
hold on
ezplot(tayser,range);
grid on
title('Taylor series approximation of log(x)')
legend(char(f),'Taylor Series approximation','Location','Best')
```

Input:

```
Command Window
New to MATLAB? See resources for Getting Started.

Enter the function f(x): log(x)
Enter the point around which Taylor series is sought: 2
Enter the number of terms: 10
Enter the range in the form [x0 x1 y0 y1] for plotting: [0.1 6 -2 3]
>>
```

Output:

```
Command Window
New to MATLAB? See resources for Getting Started.

tayser =

x/2 + log(2) - (x - 2)^2/8 + (x - 2)^3/24 - (x - 2)^4/64 + (x - 2)^5/160
```

```
Command Window
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(x - 2)^5/160 - (x - 2)^6/384 + (x - 2)^7/896 - (x - 2)^8/2048 + (x - 2)^9/4608 - 1
```
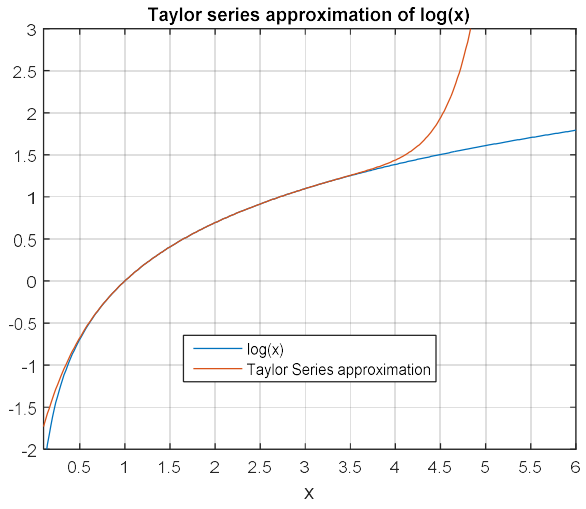

The graph:

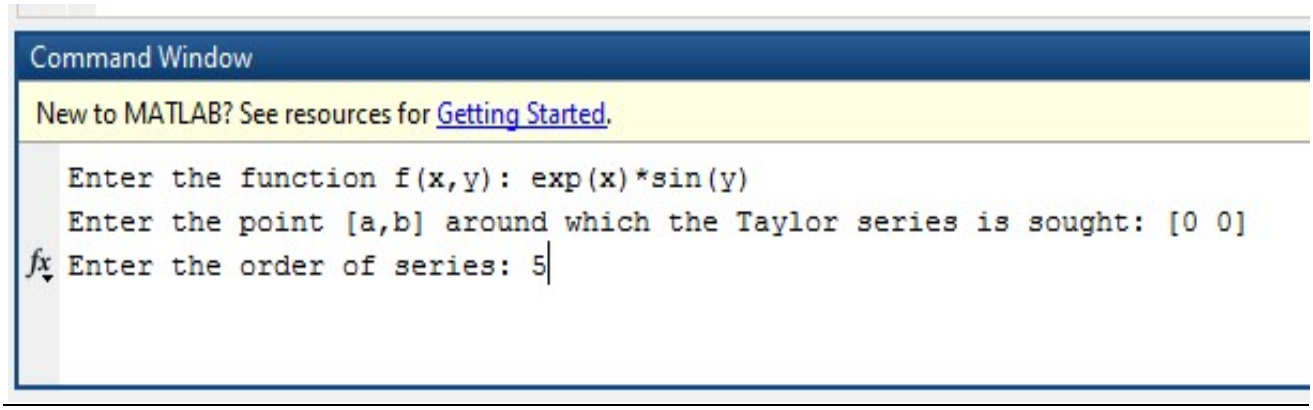


For part (2):

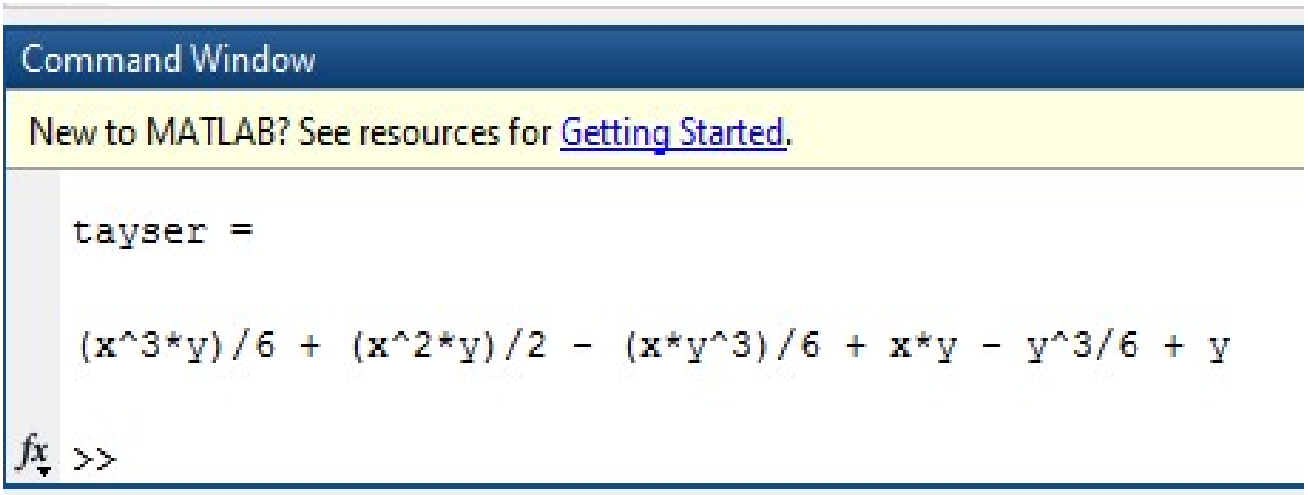
The code:

```
clc
clearvars
close all
syms x y
f = input('Enter the function f(x,y): ');
I = input('Enter the point [a,b] around which the Taylor series is sought:
');
a = I(1);b=I(2);
n = input('Enter the order of series: ');
tayser = taylor(f,[x,y],[a,b],'Order',n)
```

Input:



Output:



For Part (3):

The Code:

The Question:

Find Laplace transform of the function f(x) = x^2 , 0 ≤ x < 1;

x, 1 ≤ x < 2;

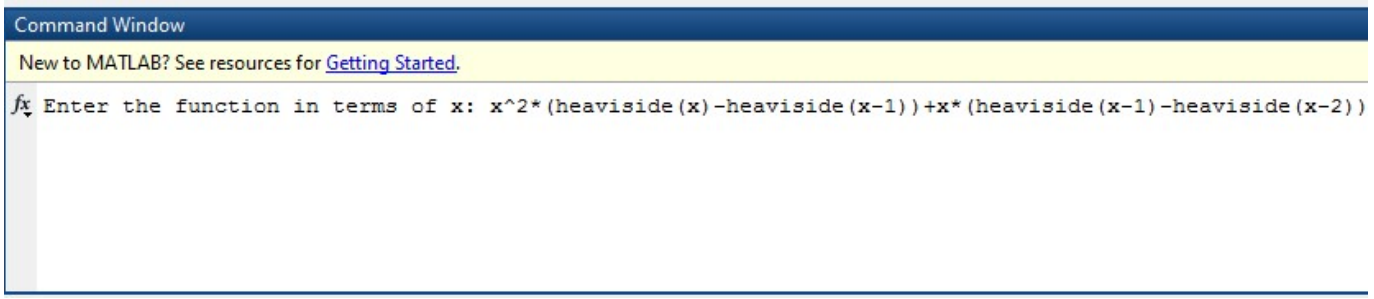
0, x ≥ 2

in terms of w.

The code:

```
clc
syms x w
f = input('Enter the function in terms of x: ');
F = laplace(f,x,w)
```

Input:



Output: