EXPERIMENT 4

AIM

Write a program to obtain the taylor series expansion of sin2x (taking at least 4 terms) .Plot and observe the combined graph of sin2x and its Taylor series expansion.

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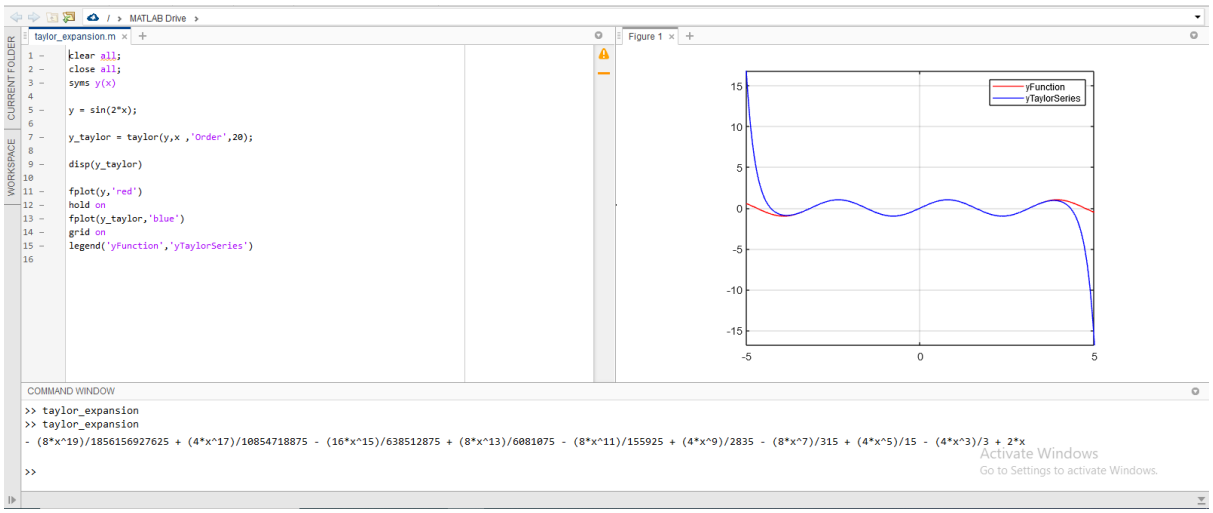
THEORY:

$$\begin{aligned}\sin x &= f(0)\frac{x^0}{0!} + f'(0)\frac{x^1}{1!} + f''(0)\frac{x^2}{2!} + f'''(0)\frac{x^3}{3!} + f^{(4)}(0)\frac{x^4}{4!} + f^{(5)}(0)\frac{x^5}{5!} + f^{(6)}(0)\frac{x^6}{6!} + \cdots \\ &= \frac{x^1}{1!} - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \cdots \\ &= \sum_{n=0}^{\infty} (-1)^n \frac{x^{2n+1}}{(2n+1)!}\end{aligned}$$

SOURCE CODE

```
clear all;
close all;


syms y(x)


%initialising function
y = sin(2*x);


%using in-built function defining taylor series of order 20
y_taylor = taylor(y,x ,'Order',20);


disp(y_taylor)


%plotting sin2x
fplot(y,'red')
hold on
%plotting taylor exp of sin2x
fplot(y_taylor,'blue')
grid on
legend('yFunction','yTaylorSeries')
```

OUTPUT:


MATLAB Drive
taylor_expansion.m
clear all;
close all;
syms y(x)
y = sin(2*x);
y_taylor = taylor(y,x ,'Order',20);
disp(y_taylor)
fplot(y,'red')
hold on
fplot(y_taylor,'blue')
grid on
legend('yFunction','yTaylorSeries')
Figure 1
yFunction
yTaylorSeries
15
10
5
0
-5
-10
-15
-5
0
5
COMMAND WINDOW
>> taylor_expansion
>> taylor_expansion
- (8*x^19)/1856156927625 + (4*x^17)/10854718875 - (16*x^15)/638512875 + (8*x^13)/6081075 - (8*x^11)/155925 + (4*x^9)/2835 - (8*x^7)/315 + (4*x^5)/15 - (4*x^3)/3 + 2*x
>>
Activate Windows
Go to Settings to activate Windows.