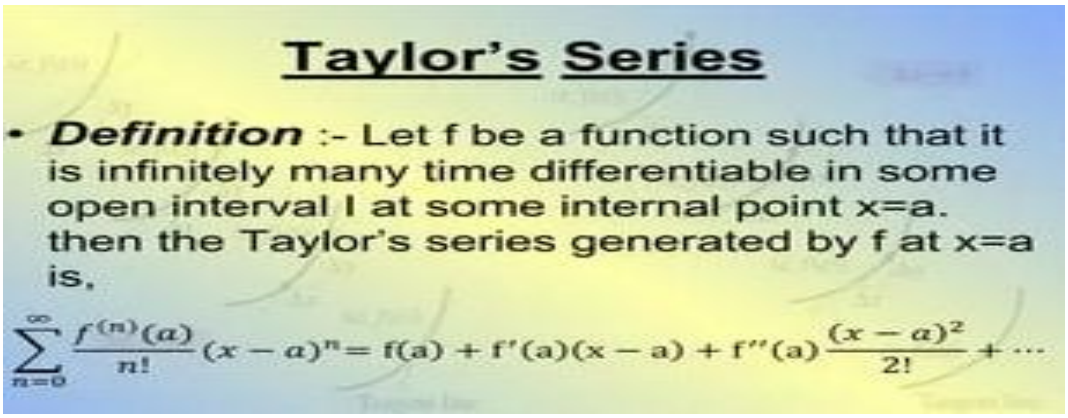
Expt10

Title: Taylor Series & Maclaurin Series of f(x) with plotting

Introduction:



Maclaurin Series of f(x)

$$f(x) = f(0) + f'(0)x + \frac{f''(0)}{2!}x^2 + \frac{f'''(0)}{3!}x^3 + \cdots + \frac{f^{(n)}(0)}{n!}x^n + \cdots = \sum_{k=0}^{\infty} \frac{f^{(k)}(0)}{k!}x^k$$

1) Expand log(x) by Taylor's series in powers of (x-1) upto 6th degree.

```
%%  1) Expand log(x) by Taylor's series in powers of (x-1) upto 6th degree.
clc
clear
syms x
f = log(x)
t = taylor(f, 'ExpansionPoint', 1, 'Order', 7)
```

OUTPUT:

```
f =
```

$\log(x)$

```
t =
```

$$x - \frac{(x-1)^2}{2} + \frac{(x-1)^3}{3} - \frac{(x-1)^4}{4} + \frac{(x-1)^5}{5} - \frac{(x-1)^6}{6} - 1$$

2) Expand exp(xsinx) by Maclaurin's series upto 8th degree

```
%% 2)Expand exp(xsinx) by Maclaurin's series upto 8th degree
clc
clear
syms x
```

```
f = exp(x*sin(x))
t = taylor(f, 'Order', 9)
```

OUTPUT:

$$f = e^{x\sin(x)}$$

$$t = -\frac{11\,x^8}{560} + \frac{x^6}{120} + \frac{x^4}{3} + x^2 + 1$$

3) Expand sin(x)/x by Maclaurin's series upto 4th degree and compare with function

```
%%3) Expand sin(x)/x by Maclaurin's series up to 4th degree and compare
with function
syms x
f = sin(x)/x
T = taylor(f,x,'Order',5)
fplot([T f])
xlim([-4 4])
grid on
legend('approximation of sin(x)/x ', 'sin(x)/x','Location','Best')
title('Maclaurin Series Expansion')
```

$$f = \frac{\sin(x)}{x}$$

$$T = \frac{x^4}{120} - \frac{x^2}{6} + 1$$