In-Service Course
(Spell I)

Venue:
IIT Gandhinagar

Study Material

Solving Taylor Series

With Python

f^n

Prepared by:
Navneet Sadh
PGT CS,KV KOKRAJHAR

1

A little math in the beginning.

(A lot actually)

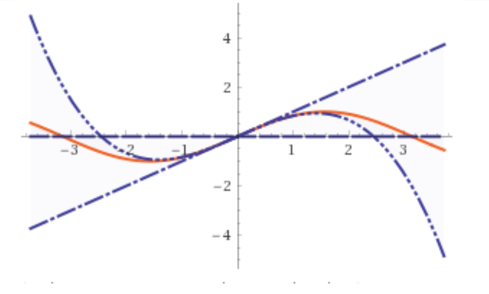
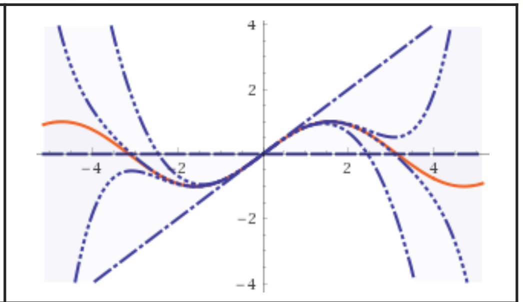
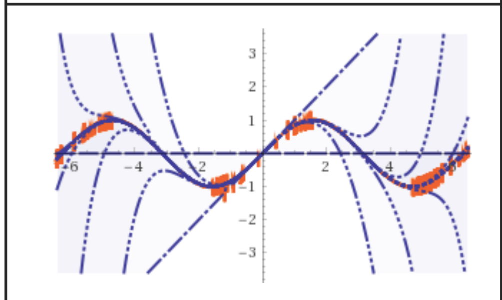
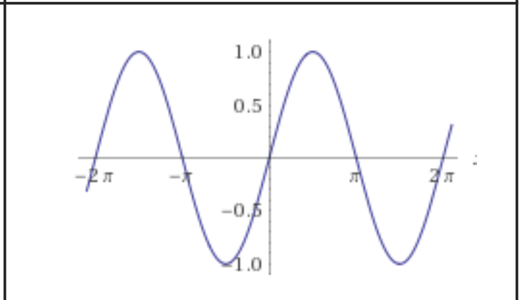
Let's learn about the problem first.

r

James Gregory	Brook Taylor	Colin Maclaurin
Did the Formulation	Formally Introduced	Used a special case
		

Faces of Taylor Series

Plotting the Graph of Sin(x): With variation in no. of terms

	
n=3	n=7
	
n=29	n=∞

On your left you can see various graphs. Each one of them are plotted with increasing order of approximation.
i.e. when we increase the number of terms.

By this we can conclude that graph becomes accurate when n approaches infinite.

That's why it is also called **'infinite series'**

The Equation.

Too much information?

No problem now we'll see the basic **equation.**

$$\sum_{n=0}^{\infty} \frac{(-1)^n}{(2n+1)!} x^{2n+1} = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!}$$

On the R.H.S the equation was solved up to 7^{th} term.

..and the answer will be: 7.3809

2 Implementation

Let’s Code.

Calling the function sin(x): Only two inputs are needed x,n

```
sin(x,n)
x=Phase
n=no. of terms
```

Definition of sin(x):

```
def sin(x,n):
    sine = 0
    for i in range(n):
        sign = (-1)**i
        sine = sine +
((x**(2.0*i+1))/
factorial(2*i+1))*sign
return sine
```

Definition of factorial (x):

```
def factorial(n):
    if n > 1:
        return n *
factorial(n-1)
    return 1
```

Observations:

1. For loop will run n no. of times
2. Power of x will increase by 2 i.e. 1,3,5,7.....
3. Each new term will have opposite sign

2 Practice

Your Turn.

Solve the following series using Python Function

1. e^x

2. $\tan^{-1}x$

3. $\cos x$

Thank You.