**Successive derivative:**If be a function of*x*then the first order derivative of*y*with respect to *x*is denoted by 

Again the derivative of first ordered derivative of *y*with respect to *x*is called second order derivative and is denoted by 

Similarly, the nth derivative of *y*with respect to *x*is denoted by 

* Find the nth derivative of the following functions:



**Homework:**

1. Find the nth derivative of the following functions:
2. , Ans: 
3. Ans: 
4. Ans: 
5. Ans:
6. Ans:
7. Ans: 
8. Ans: 
9. 
10. 
11. 
12. 
13. 
14. 

**Theorem:** State and prove Leibnitz’s theorem.

**Answer: Statement:**If *u* and *v*are two functions of *x*, then the nth derivative of their product is,



wherethe suffixes in *u* and *v* denote the order of differentiations of *u* and *v* with respect to *x*.

**Proof:** We shall prove the theorem by mathematical induction.

Step-1: Let 

By actual differentiation on both sides with respect to , we have



Thus the theorem is true for .

Step-2: Let us assume that the theorem is true for 

i.e.

Step-3: Theorem will be true for  if



is true.

Now differentiating on both sides of (1) with respect to , we get













which is exactly same of the form as (2).

Since the theorem hold for  hence it also hold for .

Hence, by the principle of mathematical induction, the theorem is true for every positive integer .

**(Proved)**

Using Leibnitz’s theorem find of the following functions:



**Homework:-**

1. 
2. 
3. 
4. 
5. 
6. 