**Derivatives**

**Rule of Derivatives:** Let  and  are constant, ,  and ware differentiable function of :

1. 
2. 
3. 
4. 
5.  and 
6.  where 

**EXAMPLE 1:** Find for the following function.

1. 

Sol: 

 

 

1. 

Sol:

 



***H.W* Ex 3:** 

***H.W* Ex 4**: 

***H.W* Ex 5**: 

**EXAMPLE 6:** 

Sol:

 

**EXAMPLE 7:** 

 

**The chain rule**

1. Suppose that  is the composite of the differentiable functions  and , then  is a differentiable function of  whose derivative at each value of is



**EXAMPLE 1:** Find  if  , 

Sol:

 , 







1. If  is a differentiable function of  and  is a differentiable function of ,then  is a differentiable of :



 

**EXAMPLE 1:** Use the chain rule to express in terms of and

  , 

Sol:

 

 

  sub 

 

**EXAMPLE 2:** Use the chain rule to express in terms of and

 , 

Sol:



 













**Higher derivative**

If a function  possesses a derivative at every point of some interval. We may form the function  and take about its derivate if it has one.



This derivative is called the second derivative of with respect to . In some manner we may define third and higher derivatives using similar notations.

**EXAMPLE 1:** Find all derivatives of the following function.

 

Sol:

 

 

 

 

**EXAMPLE 2:**

 

Sol:

 

 

 

 

**Implicit derivative**

If the formula of  is an algebraic combination of power of  and .To calculate the derivative of the implicitly defined functions. We simply differentiable both sides of the defining equation with respect to .

 **EXAMPLE 1:** Find for the following function.

1. 

Sol:

 

 

 

 

1. 

Sol:

 

 

 

 

 

1.  

Sol:

 

 

 