Consider the derivative:

 is this a true statement?

Recall that

*Derivative Product Rule*

If and are differentiable at , then so is their product , and .

*Prime notation*:

*Function notation*:

Pix of Product Rule on page 163.

Proof

Ex 1 (# 10) Find by applying the Product Rule. .

Since “the derivative of a product is *not* the product of the derivatives”, we should expect a rule for finding the derivative of a quotient since .

*Derivative Quotient Rule*

If and are differentiable at and if , then the quotient is differentiable at , and .

*Prime notation*:

*Function Notation*:

Ex Find the derivative of .

Ex 6 Find the derivative of . (Avoid having to use product AND quotient rule. FOIL top then rewrite as sum of 3 fractions. or could make a triple product rule but this is harder)

Ex 7 Find if

*Second and Higher-Order Derivatives*

If is a differentiable function, then its derivative is also a function. If is differentiable, we can differentiate to get a new function of , denoted .

So, .

 is called the ***second derivative of f***.

Notation:

 means the operation is performed twice.

If is differentiable, we can again differentiate to obtain the ***third derivative of f***, denoted

This notion can be extended to the derivative.

The notation used:

 “ super ”

 “ to the of by to the ”

 “ to the ”



Ex 8 Find all derivatives of .

Ex: Find all derivatives of

Ex: How many derivatives will it take to get before the higher order derivative of is 0?

*Derivatives of Other Trig Functions*

Ex 2 Find each derivative.

1. ; find .
2. ; find .

On your own:

Consider the Problem:

Is there a value of b that will make

Continuous at x=0? Differentiable at x=0? Explain your answer.

Ex: Verify that

What did this problem just tell us about the two functions that have the same derivative?:

Ex: (#18) Find if