**Question 1**

Upper bound:

//TODO, fix this

Let

It follows that , and

Therefore, there exists an

Then

Hence,

Question 2

a

Given series

Let

Then

*Reciprocal*

*Power rule*

Since , we use the ratio test

b

Given series

Let

Then

c

Given series

Let

Then

Since , we use the ratio test

Question 3

We also have that

We also have that , then,

LHS derivative:

RHS derivative:

Since, LHS RHS, the derivative does not exist at the point

Question 4

We have that

LHS derivative:

RHS derivative:

Question 5

Question 6

Question 7