Math 1211 Discussion Assignment 5

Assuming that there is a function which having another function as an exponent.

F(x) = g(x)h(x) = xx, g(x)= x, and h(x) = x

Recalled that the power rule, f(x) = xn where n is a constant. We can find derivatives by using this rule.

As f(x)= xn, f’(x) = nxn-1

But xx is not applying the power rule as the exponent is also a function. And the power rule only applies when the exponent is constant.

According to (*When Can Logarithmic Differentiation Be Used? - Quora*, n.d.),

We know that the inverse of the exponent function is the logarithm function. So, the better way is to transform the original exponent variable function into a relationship between domain and range. Then we can get the relationship between them by using an implicit derivative.

The concept behind this is we should attempt to use algebraic transformation to bring function into the form that is easy to take the derivative.

As we bring down the exponent to multiplication, then we can apply the production rule to solve the derivation.

Let F(x) = g(x)h(x) = xx, and

F(x)=y = xx, we can take the logarithm for both sides to bring down the exponent as normal two-function multiplication.

Taking the logarithm of y, then we have

Ln(y)= ln(xx) = xln(x), then we can use the implicit derivative calculation.

We know that y=xx, and replace y

A similar example can be another function as an exponent.

F(x)=ax

Lny= lnax = xlna, note that lna is constant no need to use the product rule.

Then

Reference

*When can logarithmic differentiation be used? - Quora*. (n.d.). Retrieved October 2, 2022, from https://www.quora.com/When-can-logarithmic-differentiation-be-used