

Math 2301 Section 11.4: The Chain Rule Algebra Supplement

Algebra you will need to know for this section includes composition of functions, a review of the order of operations, exponential rules (specifically negative exponents).

Composition of Functions – This is a handout with discussion, examples, and homework problems. The practice problems on this sheet are due as a homework grade. Please see due date as discussed in class.

Order of Operations – Just about everyone that has taken a math class has heard of PEMDAS. This is an acronym for the order of operations and stands for Parenthesis, Exponents, Multiply, Divide, Add and Subtract. A better order is: P – E – MD – AS. As multiply and divide should be computed in order from left to right and not always multiply before divide. Similarly we work with addition and subtraction from left to right taking them as they come. How does this apply to the chain rule? Always remember that exponents come before multiplication. So in a problem such as $3(2x + 5)$ we can multiply straight away to get $6x + 15$, however in $3(2x + 5)^2$ we cannot multiply the 3 through until after we take care of the squared term. Frequently we will leave an expression of this type just as it is and not get ourselves into trouble trying to over-simplify.

Exponential Rules – We've talked about this one many times, the negative on an exponent is like a direction sign telling us to move that term across the fraction bar. This process of moving across the fraction bar changes the exponent to a positive. It is important to note that only exponents change signs moving across the fraction bar and not real number values.

Quick Examples:

1. We might rewrite $\frac{1}{x^6} = x^{-6}$ in order to change the fraction into something that is easier to compute a derivative.
2. After taking the derivative, $-6x^{-6-1} = -6x^{-7}$ we may once again rewrite it back into a form with no negative exponents: $-6x^{-7} = \frac{-6}{x^7}$. Notice that the 6 did not change sign as it is a real number value, but the exponent did change signs as it move across the fraction bar.

When dealing with derivatives, try to always answer in the way the question was given. If it starts with negative exponents, leave your answer with negative exponents. If it starts with all positive exponents and you have to rewrite as a first step, then you will want to rewrite as a last step as well making sure to return all exponents to a positive position.