Ashley Lozano, Karissa Ferguson, Megan Caturia

Dr. Keith Nabb

Math 166

30 May 2017

Reflection on Chain Rule

Today in class we covered the Chain Rule. We learned that we need to use the chain rule whenever there's a smaller function inside of a larger function, and the inside function is something other than just a simple x. Such as sin($x^2 - x + 58$) or $\sqrt{15x - 4}$. This can also be written as f(g(x)) or g(f(x)), showing that there is a function within a function. The chain rule gained its name because it forms a "chain" of derivatives when used.

Some of the first problems we went through were simple because they helped us learn how to use the rule. Here's an example of a type of problem we encountered (not an exact same one from class): $y = (3x - 4)^2$.

There's more than one way to do the chain rule, but when put into words, the chain rule is easiest to explain like this: *(dy/dx)= (the derivative of outside function (inside function is left alone)) times the (derivative of inside function)* So, for this example: f(x)=$x^2$and g(x)= 3x-4. One way of solving this would be to replace g(x) with a *u*, f(x) would equal (u^2) . So, the derivative can be taken of f(x), giving 2*u*. This would then be multiplied by the derivative of g(x), which would be equal to 3. This would give us: 2*u* times by 3 or the derivative of g(x), *u* can than be replaced by g(x), giving the answer 2(3x-4) $\cdot$3. This problem can be simplified by multiplying the 2 and 3 to get 6, then distributing the 6 into the parentheses, giving the final simplified answer of 18x-24.

Another method of using the chain rule with the same problem is a little bit faster. The main difference is that the inside function or g(x) is not replaced with a *u*. So simply, $(3x - 4)^2$, which when the derivative is taken becomes $2(3x - 4)^1 \times 3$, that will simplify down to 18x-24 the same as the previous method.

The last two ways to address this problem actually do not involve the chain rule. If rewritten, this problem can be seen as (3x-4)(3x-4), so the product rule could be used or this could be foiled, and the sum/difference and power rule could come into play. Using the product rule would give: (3x-4)(3)+(3x-4)(3), which can be simplified to (9x-12)+(9x-12), add both terms together to get 18x-24, which is the same answer given by using the chain rule. By first foiling the problem, a person would get: $9x^2 - 12x - 12x + 16$ or $9x^2 - 24x + 16$, then the derivative can be taken, giving the answer of 18x-24, once again same as the answer found using the chain rule.

After practicing some simple examples to get a grasp of how the rule worked, we moved to more complex problems that involved power functions, trigonometry, and the product rule at the same time. Problems with the chain rule do not necessarily get harder, they simply just become longer. This is because the product or quotient rule may have to come into play along with the chain rule, which could also be used several times within a single problem.

Overall, the chain rule is a way to solve complex equations and functions faster! With some practice, anyone can master the chain rule.