Video 3.1A Transcript - Verify an Identity

This video presentation is to demonstrate how to verify a trigonometric identity. To verify a trigonometric identity simply means we will simplify both sides of the equal sign where, at the very end, both sides of the equal sign will be identical. In this example, since the left side is very long, we will only simplify the left side. One of the tricks to identify the identity is to write in terms of sine and cosine. I'll apply the reciprocal identity cosecant theta is equivalent to one over sine theta; times secant theta, using reciprocal identity, will be one over cosine theta; minus, applying the quotient identity, tangent theta is equal to sine theta over cosine theta, and we want it to equal cotangent theta on the right-hand side. To continue simplifying the left side of the equal sign, we will multiply one over sine theta and one over cosine theta, and that will give me one over sine theta, cosine theta. Continue to subtract sign theta over cosine theta.

To subtract these two fractions, we will first find the least common denominator, and the least common denominator between sine theta, cosine theta and cosine theta itself is going to be sine theta, cosine theta because what we are trying to do here, to find the LCD, is to count the repeated factors between the two denominators, which is cosine theta (only count that one time) and we will count the non-repeated factors between the two denominators, which is sine theta (still counted one time). So, the LCD will have to be sine theta times cosine theta. Once I find the least common denominator between the two fractions, the next step will be to increase my numerator. Sine theta, cosine theta go into the LCD only one time; let me write this down on the side: **the sine theta, cosine theta will go into the LCD, which is the same thing, only one time** because everything (top and bottom) will cancel out. So, this one time, multiply the numerator (still one) gives me one. The second denominator, cosine theta, goes into the LCD sine theta times because the cosine theta will cancel out (top and bottom), so it will equal sine theta. Cosine theta goes into the LCD sine theta times, and we take the sine theta, multiply the numerator, which is another sine theta, and that will give me sine squared theta. Once I find the LCD and increase my numerator, now we can subtract the numerator. One minus sine squared theta is still going to be sine squared theta, and we will write it as one fraction. If you look at the numerator, one minus sine squared theta, and think of the Pythagorean Identity, where sine squared theta plus the cosine squared theta is equal to one. So, if I subtract sine squared theta from both sides, that will leave me with cosine squared theta on the left equal to one minus sine squared theta on the right. So, the numerator one minus sine squared theta is equal to cosine squared theta. The reason we write it like this is so that the cosine squared theta on the numerator can cancel out with the cosine in the denominator, and that will leave me with only cosine theta on the numerator over sine theta in the denominator. By applying the quotient identity we know that cosine theta over sine theta is the same as cotangent theta. So, my final answer will be cotangent theta is equal to cotangent theta. This is the process to verify an identity. This will conclude the video presentation.