Techniques for Proving Trig Identities

1. Memorize the trig identities and know how to use them, their alternative forms, etc.
2. Same as number 1
3. The entire process is a cycle of I) making trig substitutions II) simplifying with algebra III) reevaluating in light of the target (other side of the equation)
4. Work each side independently: If you get stuck on one side, work on the other side. In the end, as long as the bottom lines of both sides are equivalent, the proof is done, Q.E.D.
5. Generally, you want to start with the side that has more information, has larger powers, etc., as it is easier to "break down" than to "build up."
6. Sometimes it helps to write everything in terms of sine and cosine.
7. Do any obvious math, such as expansion, distributing, eliminating complex fractions.
8. It is easier to combine two or more terms into one term by getting a common denominator, but you can . . .
9. You can split up the terms in a numerator by putting any combinations of terms in the numerator of the ENTIRE denominator
10. If an expression has a fraction, and either the numerator or denominator has $1 \pm$ trig function or trig function ± 1 or trig function $\pm$ trig function, try multiplying by the conjugate over the conjugate.
11. Parentheses are your BEST friend and can help you prevent careless mistakes.
12. Look for special products: common factors, difference of squares, perfect square trinomials.

    Ex1) $64 - 64\sin^2 x = 64(1 - \sin^2 x) = 64\cos^2 x$

    Ex2) $\sec^4 x - 2\sec^2 \tan^2 x + \tan^4 x = (\sec^2 x - \tan^2 x)^2 = 1^2 = 1$

    Ex3) $1 - \cos^2 x = (1 - \cos x)(1 + \cos x)$ or ?????

    Ex4) $\cos^4 x - \sin^4 x = (\cos^2 x + \sin^2 x)(\cos^2 x - \sin^2 x)$ or ????