Trigonometric identities worksheet

Prove the following trigonometric identities.

1. $\sin^2 \alpha(1 + \cot^2 \alpha) = 1$

2. $\tan \alpha \csc \alpha \cos \alpha = 1$

3. $(\sin \alpha - \cos \alpha)(\sin \alpha + \cos \alpha) = 1 - 2\cos^2 \alpha$

4. $(1 - \cos \alpha)(1 + \cos \alpha) = \dfrac{1}{\csc^2 \alpha}$

5. $\sin^2 \alpha(1 + \cot^2 \alpha) = 1$

6. $\dfrac{\sec \alpha - \cos \alpha}{\sec \alpha} = \sin^2 \alpha$

7. $\dfrac{\cot \alpha \sec \alpha}{\csc \alpha} = 1$

8. $\dfrac{1 + \tan^2 \alpha}{\sec \alpha} = \sec \alpha$

9. $\dfrac{\sin \alpha}{1 + \cos \alpha} = \dfrac{1 - \cos \alpha}{\sin \alpha}$ Hint: multiply numerator and denominator of the left hand side by $1 - \cos \alpha$.