Some Trigonometric Identities to Warm up your Neurons

Prove that each of the given equations are identities.

1. $\dfrac{\cos 2\theta}{1+\sin 2\theta} = \dfrac{\cot\theta - 1}{\cot\theta + 1}$

2. $\sin A(1+\tan A) + \cos A(1+\cot A) = \sec A + \csc A$

3. In the diagram, points P and Q lie on a circle of radius 2 centred at the origin. Use this to prove that $\cos(\theta - \beta) = \cos\theta\cos\beta + \sin\theta\sin\beta$.