Using $\sec, \csc, \cot$

Questions in the exam usually come in two flavours: (a) 'provey' questions requiring to prove some identity and (b) 'solvey' questions.

[Textbook]
(a) Simplify $\sin\theta \cot\theta \sec\theta$
(b) Simplify $\sin\theta \cos\theta \ (\sec\theta + \csc\theta)$
(c) Prove that $\dfrac{\cot\theta \ \csc\theta}{\sec^2\theta + \csc^2\theta} \equiv \cos^3\theta$

Tip 1: Get everything in terms of $\sin$ and $\cos$ first (using $\cot x = \dfrac{\cos x}{\sin x}$ rather than $\cot x = \dfrac{1}{\tan x}$)

Tip 2: Whenever you have algebraic fractions being added/subtracted, whether $\dfrac{a}{b} + \dfrac{c}{d}$ or $\dfrac{a}{b} + c$, combine them into one (as we can typically then use $\sin^2 x + \cos^2 x = 1$)

Test Your Understanding

1   $\sec x - \cos x \equiv \sin x \tan x$

2   $(1 + \cos x)(\csc x - \cot x) \equiv \sin x$