1 Show that $\tan\theta + \cot\theta$ can be written as $\sec\theta \operatorname{cosec}\theta$. [3]

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2 **(a)** Given that $y = \tan x - x$, find $\frac{\mathrm{d}y}{\mathrm{d}x}$. Write your answer in terms of $\tan x$. [2]

(b) Hence find $\int_0^{\frac{\pi}{4}} \tan^2 x \mathrm{d}x$. Give your answer in exact form. [2]

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