t-formula Proofs

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1 Introduction

In this example we will use the t-formula to prove some simple trigonometric identities

2 Proof 1

Prove the following identity:

$$\frac{1 + \operatorname{cosec}\theta}{\cot\theta} = \frac{1 + \tan\frac{\theta}{2}}{1 - \tan\frac{\theta}{2}} \tag{1}$$

Using $t = \tan\frac{\theta}{2}$,