

Prove the following identities

$$\cot^2 \theta \csc^2 \theta - \cot^2 \theta = \cot^4 \theta$$

Prove the following identities

$$\frac{3 \cos^2 \theta + \cos \theta - 4}{-\sin^2 \theta} = \frac{3 \cos \theta + 4}{\cos \theta + 1}$$

Prove the following identities

$$\frac{\sec^2 \theta - \tan \theta - 7}{\sec^2 \theta - 5} = \frac{\tan \theta - 3}{\tan \theta - 2}$$

Prove the following identities

$$\frac{\csc^2 \theta + \cot \theta - 13}{\csc^2 \theta - 17} = \frac{\cot \theta - 3}{\cot \theta - 4}$$

Prove the following identities

$$\tan^4 \theta - 3 \tan^2 \theta - 4 = \frac{(\tan \theta - 2)(\tan \theta + 2)}{(1 + \sin \theta)(1 - \sin \theta)}$$

Prove the following identities

$$20 = (4 \sin \theta + 2 \cos \theta)^2 + (2 \sin \theta - 4 \cos \theta)^2$$