

99.26 Proof without words: $\operatorname{cosec} 2x = \cot x - \cot 2x$

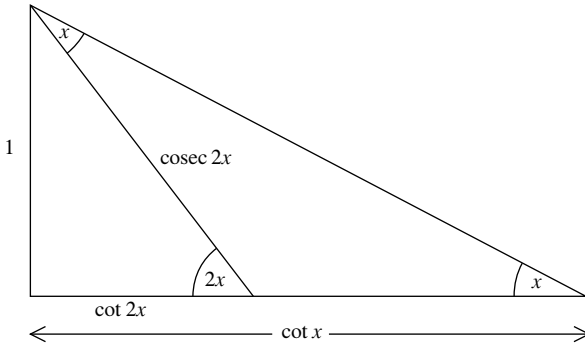


FIGURE 1

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Teaching Notes

Complex numbers and triangles

The following investigation provides excellent practice in the arithmetic of complex numbers and their representation as both points and directed edges in the Argand plane. Students should be able to conjecture a surprisingly general result about triangles which has an elementary proof.

Investigation

In the Argand plane, any three non-zero complex numbers with sum zero can be represented by the directed edges of a triangle. Examples of both a clockwise and an anticlockwise ordering of edges are shown:-

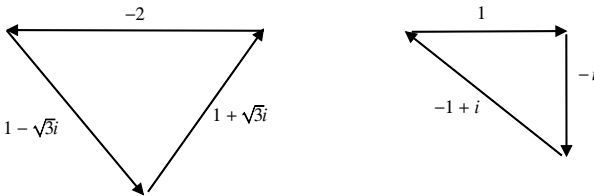


FIGURE 1

For any two triangles and for an arbitrary pairing of the edges of one triangle with those of the other, plot the points representing the three numbers $\frac{\text{edge of one triangle}}{\text{corresponding edge of other triangle}}$.

What do you notice?