Precalculus
Complex multiplication involving real radicalss

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Example (Complex multiplication)

Multiply $u = \frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2}i$ by $v = \frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2}i$.

$$\begin{aligned}
u \cdot v &= \left(\frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2}i\right) \cdot \left(\frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2}i\right) \\
&= \frac{\sqrt{2}^2}{2^2} - \frac{\sqrt{2}^2}{2^2}i + \frac{\sqrt{2}^2}{2^2}i\frac{\cancel{\sqrt{2}^2}}{\cancel{2^2}}i + \frac{\cancel{\sqrt{2}^2}}{\cancel{2^2}}i - \frac{\sqrt{2}^2}{2^2}i^2 \\
&= \frac{2}{4} - \frac{2}{4}(-1) \\
&= \frac{1}{2} + \frac{1}{2} \\
&= 1
\end{aligned}$$