

$$\begin{aligned}
|x+y|^2 &= \langle x+y, x+y \rangle \\
&= \langle x, x \rangle + \langle y, y \rangle + 2\langle x, y \rangle \\
&= |x|^2 + |y|^2 + 2\langle x, y \rangle \\
&= |x|^2 + |y|^2
\end{aligned}$$