Math Homework Week 2

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3.1

$$\|v \cdot w\|^2 = \langle v + w, w + v \rangle$$

$$\begin{aligned} \|v \cdot w\|^2 &= \langle v + w, w + v \rangle \\ &= \langle v, w \rangle + \langle w, v \rangle + \langle v, v \rangle + \langle w, w \rangle \\ &= \|v\|^2 + \|w\|^2 + \langle w, v \rangle + \overline{\langle v, w \rangle} \\ &= \|v\|^2 + \|w\|^2 + 2\mathbb{R}(\langle w, v \rangle) \end{aligned} \tag{1}$$

$$\|v \cdot w\|^2 - \|w\|^2 - \|v\|^2 = 2\mathbb{R}(\langle w, v \rangle)$$

$$\mathbb{R}(\langle w, v \rangle) = \frac{1}{2}(\|v \cdot w\|^2 - \|w\|^2 - \|v\|^2)$$