Hint for 2.5,

① $\forall\, u, v, w$

$$(u|w) + (v|w)$$

$$= \frac{1}{4}\left[\|u+w\|^2 - \|u-w\|^2 + \|v+w\|^2 - \|v-w\|^2\right]$$

$$= \frac{1}{4}\left\{\left[\left\|\frac{u+v}{2} + w + \frac{u-v}{2}\right\|^2 + \left\|\frac{u+v}{2} + w - \frac{u-v}{2}\right\|^2\right] - \left[\left\|\frac{u+v}{2} - w + \frac{u-v}{2}\right\|^2 + \left\|\frac{u+v}{2} - w - \frac{u-v}{2}\right\|^2\right]\right\}$$

$$= \frac{1}{4}\left\{\left[2\left\|\frac{u+v}{2} + w\right\|^2 + 2\cancel{\left\|\frac{u-v}{2}\right\|^2}\right] - \left[2\left\|\frac{u+v}{2} - w\right\|^2 + 2\cancel{\left\|\frac{u-v}{2}\right\|^2}\right]\right\}$$

$$= 2\left(\frac{u+v}{2}\,\Big|\, w\right)$$

② Let $v=0$

$$(u|w) = 2\left(\frac{u}{2}\,\Big|\, w\right) \qquad \forall u$$

so that

$$2\left(\frac{u+v}{2}\,\Big|\, w\right) = (u+v|w).$$

Done!

② The other parts of the proof require the limit process.