$-(-v) = v \quad (\forall)\ v \in V$

$v + (-v) = 0 \quad \forall\ v \in V$ (additive inverse)

$(-v) + (-(-v)) = 0 \quad \forall\ v \in V$ (additive inverse) $\Rightarrow$

The additive inverse of $(-v)$ is unique

$\Rightarrow v = (-(-v))$

□