

Suppose  $T \in \mathcal{L}(V)$  and  $U$  is a subspace of  $V$ . Prove that  $U$  is invariant under  $T$  iff  $U^\perp$  is invariant under  $T^*$ .

This implies that both directions, since  $U = U^{\perp\perp}$  and  $T = (T^*)^*$