

Step-1

Which is the sum of the $\lambda^i s$.

Explanation: $\text{Trace } AB = ((aq + bs) + (cr + dt))$

$= (qa + rc) + (sb + td)$ $\text{trace } BA$.

Proof for diagonalizable case: The trace of $S\Lambda S^{-1}$ is the trace of $(\Lambda S^{-1})S = \Lambda$.