Homework 2 - Quantities and values

Q2.1. Let

$$\langle x|x \rangle = \langle y|y \rangle = 1 \qquad\qquad (Q2.1.1)$$

$$\langle x|y \rangle = 0 \qquad\qquad (Q2.1.2)$$

and

$$L_{xy} = i\,|y\rangle\,\langle x| - i\,|x\rangle\,\langle y| \qquad\qquad (Q2.1.3)$$

Determine the eigenvalues and eigenspaces of L_{xy} and show that they are orthogonal and complete.

Q2.2. Express $|x\rangle$ and $|y\rangle$ in terms of the eigenvectors of L_{xy}. Calculate $\langle x|\,L_{xy}\,|x\rangle$ and $\langle x|\,L_{xy}^2\,|x\rangle$.