$$|0\rangle = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$

$$|1\rangle = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$$

$$\langle 0|0\rangle = 1 = \langle 1|1\rangle$$

$$\langle 0|1\rangle = 0$$

$$(A \otimes B)(C \otimes D) = AC \otimes BD$$

$$A - \lambda I = \frac{1}{2}\begin{pmatrix} 3 & -1 \\ -1 & 3 \end{pmatrix} - \lambda \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} = \begin{pmatrix} \frac{3}{2} - \lambda & -\frac{1}{2} \\ -\frac{1}{2} & \frac{3}{2} - \lambda \end{pmatrix}$$

$$UAU^\dagger$$

$$\xmapsto{\det} \left(\frac{3}{2} - \underset{\xi}{\lambda}\right)^2 - \left(-\frac{1}{2}\right)^2 = 0$$

$$M_m = |m\rangle\langle m| \quad , \quad M_m^\dagger = M_m$$

$$M_m^2 = (|m\rangle\langle m|)^2 = |m\rangle \underbrace{\langle m|m\rangle}_{=1} \langle m| = |m\rangle\langle m| = M_m$$

$$\langle\psi| \underbrace{M_m^\dagger M_m}_{= M_m^2 = M_m} |\psi\rangle = \underbrace{\langle\psi|m\rangle}_{\langle m|\psi\rangle^*}\langle m|\psi\rangle = \underline{\underline{|\langle m|\psi\rangle|^2}} = p(m)$$

$$|\psi\rangle = |m'\rangle$$

$$\langle m'|A|m'\rangle = \langle m'| \sum_m m|m\rangle\langle m| \, |m'\rangle$$

$$\langle m'|A|m'\rangle = \langle m'|\sum_m m|m\rangle\langle m|\,|m'\rangle$$

$$= \sum_m m \underbrace{\langle m'|m\rangle}_{= \begin{cases} 1 & \text{if } m'=m \\ 0 & \text{otherwise} \end{cases}}\langle m|m'\rangle = m'$$

$$\sigma_A^2 = 0$$