

$$n | \hat{P} | m \rangle$$

↓  
行列成分

$$\begin{pmatrix} \langle 1 | \hat{P} | 1 \rangle & \langle 1 | \hat{P} | 2 \rangle \\ \langle 2 | \hat{P} | 1 \rangle & \langle 2 | \hat{P} | 2 \rangle \end{pmatrix}$$

期待値

$$\boxed{\langle \Psi | \hat{Q} | \Psi \rangle}$$

$\hat{P}$  の表現

$$\begin{pmatrix} 1 & 1+L \\ 1-L & 2 \end{pmatrix}$$

$$\left\{ \hat{P}_\tau \begin{pmatrix} 1 & 1+L \\ 1-L & 2 \end{pmatrix} \right\}^* =$$

$$\underbrace{\langle \Psi |}_{\text{左ベクトル}} \Rightarrow = \langle \Psi |$$

$$\langle m | \hat{P}^+ | n \rangle = \langle m | \hat{P} | n \rangle^*$$

$\hat{P}$  厄米共轭

$$(\hat{P}^\dagger) = \langle m | \hat{P} | n \rangle \quad \text{定義 1}$$

$$\langle m | \hat{P}^+ | n \rangle = \langle m | \hat{P} | n \rangle$$

$$\hat{P}^+ = \hat{P}$$



$$\langle m | \hat{p}^\dagger | m \rangle = \langle m | \hat{p}^\dagger m \rangle$$

$$(7.12) = \langle m | \hat{p} | m \rangle^*$$

$$= \langle m | \hat{p} m \rangle^*$$

$$= \langle \hat{p} m | m \rangle$$

$$\int \Psi_m^* \hat{p} \Psi_m dx$$

$$\stackrel{II}{=} \langle m | \hat{p}^\dagger m \rangle$$

$$\langle m | \hat{p}^\dagger = \langle \hat{p} m |$$

$$p \text{ and } p^\dagger \text{ are Hermitian}$$

$$\langle m | \hat{p}^{\dagger\dagger} = \langle \hat{p}^\dagger m |$$

$$\hat{p}^{\dagger\dagger} = \hat{p} \quad \langle m | \hat{p} = \langle \hat{p}^\dagger m |$$

$$p = \begin{pmatrix} q & q+i \\ q-i & 2 \end{pmatrix}$$

$$p^\dagger = \begin{pmatrix} q & q-i \\ q+i & 2 \end{pmatrix}^* = \begin{pmatrix} q & q+i \\ q-i & 2 \end{pmatrix}$$

$$(q^\dagger)^* = \begin{pmatrix} q & q-i \\ q+i & 2 \end{pmatrix}^* = \begin{pmatrix} q & q+i \\ q-i & 2 \end{pmatrix}$$