Homework 2.2.2.1 The vector function

$f\left(\begin{pmatrix}\chi\\ \psi\end{pmatrix}\right) = \begin{pmatrix}\chi\psi\\ \chi\end{pmatrix}$ is a linear transformation.

True / False.

① $f(\alpha x) \neq \alpha f(x)$

$$f(\alpha x) = f\left(\alpha\begin{pmatrix}\chi_0\\ \chi_1\end{pmatrix}\right) = f\left(\begin{pmatrix}\alpha\chi_0\\ \alpha\chi_1\end{pmatrix}\right) = \begin{pmatrix}\alpha^2\chi_0\chi_1\\ \alpha\chi_0\end{pmatrix}$$

$$\alpha f(x) = \alpha f\left(\begin{pmatrix}\chi_0\\ \chi_1\end{pmatrix}\right) = \alpha\cdot\begin{pmatrix}\chi_0\chi_1\\ \chi_0\end{pmatrix} = \begin{pmatrix}\alpha\chi_0\chi_1\\ \alpha\chi_0\end{pmatrix}$$

② $f(x+y) \stackrel{?}{=} f(x)+f(y)$