This is a diff. eq. with constant coefficient. We try a solution of the form
\[ xx = Ax e^{i\omega t} \]

\[ \implies (-\omega^2 i + ki)A = 0 \]

Non-zero solutions exist if the determinant vanishes
\[ \det(-\omega^2 i + ki) = 0 \]

\[ \implies \text{characteristic equation} \]

Eigen vectors:
\[ (-\omega^2 i + ki) \text{Adj} = 0 \]

\[ \implies \text{substitute complex conjugate, } K_{ij} \text{ is real} \]

\[ \implies \left( \omega^2 - \omega^2 \right) \text{Adj} = 0 \]

\[ \implies \omega^2 = \omega^2 \implies \omega^2 \in \mathbb{R} \]

We can also multiply by \( A_i \): \( \omega^2 \)

Then
\[ \left( \omega^2 - \omega^2 \right) A_i \text{Adj} = 0 \]

\[ \implies A_i \text{ Adj} = 0 \]