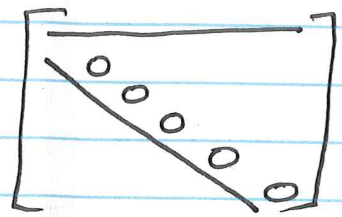
Power-Pos. Matrices guaranteed to do this

" " " Capable of more-exotic dynamics

Summary of Chapter 2

1) Age structured models

Leslie matrix, Euler-Lotka formula



2) Stage-class models

more general projection matrix

3) Key tools:

- matrix-vector multiplication $\vec{n}(t) = A^t \vec{n}(0)$
- eigenvalues λ : $A\vec{w} = \lambda \vec{w}$
  eigenvector $\vec{w}$
- solution in terms of eigs:

$$\vec{n}(t) = \sum_{i=1}^{n} c_i \lambda_i^t \vec{w}_i$$

$$\vec{n}(0) = \sum_i c_i \vec{w}_i \leftarrow \text{change of bases}$$

$$= W\vec{c}$$

$$\Rightarrow \vec{c} = W^{-1}\vec{n}(0)$$

$$\vec{n}(t) \sim c_1 \lambda_1^t \vec{w}_1$$

Perron-Frobenius makes this certain

- sensitivity

$$v^T W = \lambda v^T$$

$$\Rightarrow \frac{\partial \lambda}{\partial a_{ij}} = \frac{v_i w_j}{v^T w}$$