

# MA 266 Lecture 34

## 7.8 Repeated Eigenvalues

In this section, we consider the linear homogeneous system with constant coefficients

$$\mathbf{x}' = A\mathbf{x}$$

in which  $A$  has a repeated eigenvalue.

**Example 1.** Find the eigenvalues and eigenvectors of the following matrices

$$A_1 = \begin{pmatrix} 2 & 0 \\ 0 & 2 \end{pmatrix} \quad A_2 = \begin{pmatrix} 1 & -1 \\ 1 & 3 \end{pmatrix}$$

**Remark.**  $A_1$  and  $A_2$  have a repeated eigenvalue  $r = 2$  with (algebraic) multiplicity 2.

- For  $A_1$ , there are two
- For  $A_2$ , there is only one

**Example 2.** Find a fundamental set of solutions of

$$\mathbf{x}' = A_2\mathbf{x}$$

**general case**

If the matrix  $A$  has a double eigenvalue  $r$ , but there is only one eigenvector  $\xi$ , then