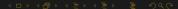
Math 2130 Linear Algebra Week 6 Dimension

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# Today's topics

- Bases
- 2 Dimension

#### Bases

#### Definition (Basis)

A set of vectors  $\{v_1, v_2, \dots, v_k\}$  in a vector space V is a *basis* for V when

- $(v_1, v_2, \ldots, v_k)$  is linearly independent.

### Bases

Show that

$${x^2 + x + 1, x^2 + x + 2, x^2 + 2x + 3}$$

is a basis for  $P_2$ .

## Dimension

#### Definition (Dimension)

The dimension of a vector space V is the size of any basis for V.

#### Dimension

The preceding definition makes sense because of the following theorem.

#### Theorem

Each basis for a vector space V contains the same number of vectors as any other basis for V.

#### Dimension |

#### Definition (Row space)

The *row space* of an  $m \times n$  matrix A is the subspace of  $\mathbb{R}^n$  spanned by the rows of A. We denote the row space of A by  $\mathrm{Row}(A)$ .

## Dimension

- The rank of a matrix A is  $\dim(\text{Row}(A))$ .
- lacktriangle This is the same as the number of leading 1s in any echelon form of A.