

**WORKSHEET 2/6/23**  
**MATH 2331, SPRING 2023**

- (1) Describe the span of  $\left\{ \begin{bmatrix} 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \end{bmatrix} \right\}$ .
- (2) Describe the span of  $\left\{ \begin{bmatrix} 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 2 \\ 0 \end{bmatrix} \right\}$ .
- (3) Find a collection of vectors that spans the image of each matrix. Be as efficient as you can!
- (a)  $\begin{bmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$
- (b)  $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \end{bmatrix}$
- (c)  $\begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \end{bmatrix}$
- (4) Are the the column vectors of the matrix from part (c) linearly independent?
- (5) Are there any nontrivial linear relations among the vectors  $\vec{v}_1 = (1, 2, 3)$ ,  $\vec{v}_2 = (4, 5, 6)$ , and  $\vec{v} = (7, 8, 9)$ ?
- (6) How large could a collection of linearly independent vectors in  $\mathbb{R}^n$  be?
- (7) Suppose that  $\vec{v}_1$ ,  $\vec{v}_2$ , and  $\vec{v}_3$  are linearly independent vectors. How many ways could there be to write a vector  $\vec{v}$  as a linear combination of these vectors?