

# Quiz #7

Please print your name:

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**Problem 1.** Find a basis for  $\text{col}(A)$ , and determine the dimension of  $\text{col}(A)$ .

No computations necessary!

(a)  $A = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$

basis:	dim =
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(b)  $A = \begin{bmatrix} 1 & 1 & -1 \\ 0 & 2 & 0 \\ 0 & 0 & 0 \end{bmatrix}$

basis:	dim =
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(c)  $A = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 4 \end{bmatrix}$

basis:	dim =
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(d)  $A = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 0 & 0 \\ 2 & 4 & 0 \end{bmatrix}$

basis:	dim =
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**Solution.**

(a) basis:  $\begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$ . dim = 1

(b) basis:  $\begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 2 \\ 0 \end{bmatrix}$ . dim = 2

(c) basis:  $\begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 3 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ 4 \end{bmatrix}$ . dim = 3

(d) basis:  $\begin{bmatrix} 1 \\ 0 \\ 2 \end{bmatrix}, \begin{bmatrix} 1 \\ 0 \\ 4 \end{bmatrix}$ . dim = 2

□

**Problem 2.** Find a basis for  $\text{col}(A)$  with  $A = \begin{bmatrix} 1 & -1 & 1 & 2 \\ 2 & 2 & 6 & 5 \\ 3 & 1 & 7 & 7 \end{bmatrix}$ .

(Make sure to show your work!)

**Solution.**

$$\begin{bmatrix} 1 & -1 & 1 & 2 \\ 2 & 2 & 6 & 5 \\ 3 & 1 & 7 & 7 \end{bmatrix} \xrightarrow[\sim]{\begin{matrix} R_2 - 2R_1 \Rightarrow R_2 \\ R_3 - 3R_1 \Rightarrow R_3 \end{matrix}} \begin{bmatrix} 1 & -1 & 1 & 2 \\ 0 & 4 & 4 & 1 \\ 0 & 4 & 4 & 1 \end{bmatrix} \xrightarrow[\sim]{R_3 - R_2 \Rightarrow R_3} \begin{bmatrix} 1 & -1 & 1 & 2 \\ 0 & 4 & 4 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

The third and fourth column correspond to a free variable.

Hence, a basis for  $\text{col}(A)$  is given by  $\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}, \begin{bmatrix} -1 \\ 2 \\ 1 \end{bmatrix}$ .

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