

## Test #1 Worksheet

Complete this worksheet in class. *No answers will be provided.* Please check your work with a friend, or the instructor.

**Question 0.1** The notation  $I_k$  denotes  $k \times k$  identity matrix. For example,

$$I_3 = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

- Find a matrix  $B$  such that  $B \neq I_4$  and  $B^2 = I_4$ .
- If the product  $I_6MI_3$  is defined, what are the dimension of  $M$ ?

**Question 0.2** Consider the following matrices:

$$A_1 = \begin{bmatrix} -2 & 4 & 4 \\ -1 & 2 & 1 \\ -2 & 2 & 2 \end{bmatrix} \quad A_2 = \begin{bmatrix} 1 & 1 & 2 \\ 1 & 1 & 2 \\ 0 & 3 & 3 \end{bmatrix} \quad A_3 = \begin{bmatrix} 1 & 0 & 1 \\ 1 & 2 & 0 \\ 0 & 3 & 1 \end{bmatrix}$$

- Determine if each matrix above is invertible.  
If a matrix is invertible, then invert it.
- Write  $\vec{b} = [1, 2, 3]^T$  as a sum of multiples of columns of  $A_3$ .
- Solve  $A_3\vec{x} = \vec{b}$  using row reduction.
- Calculate  $(A_3^{-1})\vec{b}$  using matrix multiplication.

**Question 0.3 (Curve fitting)** Find values of  $a$ ,  $b$ , and  $c$  such that

$$y = ax^2 + bx + c$$

passes through the points  $(1, 1)$ ,  $(2, 5)$ , and  $(3, 10)$ .