

This quiz has three problems worth 10 points.

1. (4 points) For each augmented matrix below, **state in words what the next elimination step** would be and **write out the elimination matrix for that step**. (Your words can be something like, "Add row 1 to row 2." You do not have to perform the elimination step.)

(a)  $\begin{bmatrix} 1 & 2 & 3 & 0 \\ 0 & 5 & -1 & 7 \\ 0 & -2 & 0 & 1 \end{bmatrix}$

Add  $\frac{2}{5}$  row 2 to row 3 to get a zero in position  $a_{32}$ .

$$E_{32} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & \frac{2}{5} & 1 \end{bmatrix}$$

(b)  $\begin{bmatrix} 1 & 2 & 3 & 0 \\ 0 & 0 & -1 & 7 \\ 0 & 8 & 4 & 1 \end{bmatrix}$

Exchange rows 2 and 3

$$P_{23} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}$$

2. (2 points) The matrices  $C$  and  $D$  are written below. Of the two possible products, namely  $CD$  or  $DC$ , only one is defined. **State** which one is defined and calculate the product.

$$C = \begin{bmatrix} 2 & \pi \\ -1 & 0 \end{bmatrix} \quad D = \begin{bmatrix} 1 & 1 \\ -1 & 0 \\ 1 & 2 \\ 0 & -1 \end{bmatrix}$$

$$DC = \begin{bmatrix} 1 & 1 \\ -1 & 0 \\ 1 & 2 \\ 0 & -1 \end{bmatrix} \begin{bmatrix} 2 & \pi \\ -1 & 0 \end{bmatrix} = \begin{bmatrix} 2-1 & \pi \\ -2 & -\pi \\ 2-2 & \pi \\ 1 & 0 \end{bmatrix} = \begin{bmatrix} 1 & \pi \\ -2 & -\pi \\ 0 & \pi \\ 1 & 0 \end{bmatrix}$$

$(4 \times 2) (2 \times 2) \quad (4 \times 2)$

3. (4 points) Suppose  $A$  is a  $30 \times 50$  matrix and  $B$  is a  $50 \times 40$  matrices.

(a) What is the dimension of the matrix  $AB$ ?

$$30 \times 40$$

(b) What rows or columns or matrices to you multiply to find

i. column 10 of  $AB$ ?

$$A \text{ col}_{10} B = A \overset{\text{or}}{\vec{b}_{10}}$$

matrix vector product of  $A$  and row 10 of  $B$

ii. row 15 of  $AB$ ?

$$\text{row}_{15}(A) \cdot B = [a_{15,1} \ a_{15,2} \ \dots \ a_{15,50}] \cdot B$$

iii. the entry in row 4 and column 5 of  $AB$ ?

$$\text{row}_4(A) \cdot \text{col}_5(B)$$