

Practice midterm

- Q1. Find the rank of

$$\begin{pmatrix} 1 & 2 & 3 \\ 4 & 7 & 9 \\ 10 & 11 & 12 \\ 1 & 0 & 0 \\ 0 & 2 & 2 \\ 1 & 1 & 0 \end{pmatrix}$$

- Q2. Let $T : \mathbf{R}^2 \rightarrow \mathbf{R}^2$ be the linear transformation corresponding to counter-clockwise rotation by $\frac{\pi}{6}$ radians around the origin. Let A be the matrix associated to T . Compute the matrix A^3 .
- Q3. Find the inverse of

$$\begin{pmatrix} 1 & 2 & 3 \\ 1 & 3 & 5 \\ 1 & 3 & 6 \end{pmatrix}$$

- Q4. Let k be a real number, and let A be the matrix

$$A = \begin{pmatrix} 1 & 1 & 1 \\ 1 & 2 & k \\ 1 & 4 & k^2 \end{pmatrix}.$$

Determine all values of k for which the linear system

$$\begin{pmatrix} 1 & 1 & 1 \\ 1 & 2 & k \\ 1 & 4 & k^2 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 5 \\ 10 \\ 21 \end{pmatrix}$$

has exactly one solution.