Name SOLUTIONS

# Mathematics 1553

Quiz 7

Prof. Margalit

Section G1/Arjun G2/Talha G3/Athreya G4/Olivia G5/James (circle one!)

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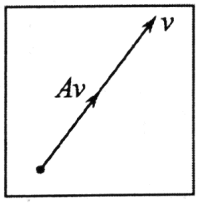
1. Define what it means for a vector $v$ to be an eigenvalue of a matrix $A$.

$v \neq 0$ & $Av$ is a scalar multiple of $v$

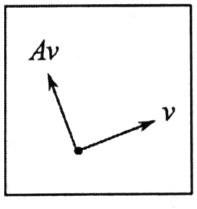
2. The eigenvalues of a matrix $A$ are $-1$, 0, and 1. Is $A$ invertible?

YES (NO) MAYBE

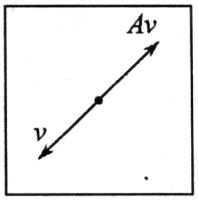
3. Under each picture, write the *eigenvalue* being depicted (an estimate is fine). If the picture does not show an eigenvector, write NO. Only real numbers are allowed. The black dot is the origin.



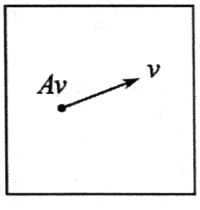

1/2




NO




-1




0

*Turn the page!*

4. Find the eigenvalues and corresponding eigenvectors.

$$\begin{pmatrix} 0 & 1 \\ -2 & -3 \end{pmatrix}$$

Eigenvalues: $\det \begin{pmatrix} -\lambda & 1 \\ -2 & -3-\lambda \end{pmatrix} = \lambda^2 + 3\lambda + 2$

$= (\lambda+2)(\lambda+1)$

$\rightsquigarrow \lambda = -1, -2$

Eigenvectors:

$\boxed{\lambda = -1}$ $\begin{pmatrix} 1 & 1 \\ -2 & -2 \end{pmatrix} \rightsquigarrow \begin{pmatrix} 1 & 1 \\ 0 & 0 \end{pmatrix} \rightsquigarrow x+y=0$

$\rightsquigarrow \begin{pmatrix} 1 \\ -1 \end{pmatrix}$

$\boxed{\lambda = -2}$ $\begin{pmatrix} 2 & 1 \\ -2 & -1 \end{pmatrix} \rightsquigarrow \begin{pmatrix} 2 & 1 \\ 0 & 0 \end{pmatrix} \rightsquigarrow 2x+y=0$

$\rightsquigarrow \begin{pmatrix} 1 \\ -2 \end{pmatrix}$