

9.2

24) In each part, find as many linearly independent eigenvectors as you can by inspection (by visualizing the geometric effect of the transformation on \mathbb{R}^2). For each of your eigenvectors find the corresponding eigenvalue by inspection; then check your ~~est~~ results by computing the eigenvalues and bases for the eigenspaces from the standard matrix for the transformation.

(a) reflection about the x -axis

(b) reflection about the y -axis

(c) reflection about $y = x$

(d) shear in the x -direction with factor k

(e) shear in the y -direction with factor k

(f) rotation through the angle θ

(Answers)

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|---|---|
| (a) $\lambda_1 = 1 : \begin{bmatrix} 1 \\ 0 \end{bmatrix}$; $\lambda_2 = -1 : \begin{bmatrix} 0 \\ 1 \end{bmatrix}$
(b) $\lambda_1 = 1 : \begin{bmatrix} 0 \\ 1 \end{bmatrix}$; $\lambda_2 = -1 : \begin{bmatrix} 1 \\ 0 \end{bmatrix}$
(c) $\lambda_1 = 1 : \begin{bmatrix} 1 \\ i \end{bmatrix}$; $\lambda_2 = -1 : \begin{bmatrix} -1 \\ i \end{bmatrix}$
(d) $\lambda = 1 : \begin{bmatrix} 1 \\ 0 \end{bmatrix}$
(e) $\lambda = 1 : \begin{bmatrix} 0 \\ 1 \end{bmatrix}$ | (f) (θ an odd integer multiple of π) $\lambda = -1 : (1, 0), (0, 1)$
(θ an even integer multiple of π) $\lambda = 1 : (1, 0), (0, 1)$
(θ not an integer multiple of π) no real eigenvalues |
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