

Work in groups of three to work through the following examples.

1. Write the matrices for:
  - (a) a  $90^\circ$  clockwise rotation
  - (b) a  $30^\circ$  counter-clockwise rotation
  - (c) reflection across the  $y$ -axis
  - (d) dialation by a factor of 3
  - (e) vertical expansion by a factor of 5
  - (f) horizontal shear by  $+\frac{1}{3}$
  - (g) projection onto the  $x$ -axis
  - (h) projection onto the line  $2x + 3y = 0$
2. Find the image and the kernel for the linear transformations above.
3. For each of the linear tranformations above, figure out whether or not it has an inverse. If it does, describe the inverse in words and write down its matrix; if not, explain why not.
4. Find the eigenvalues and eigenvectors of the linear transformations above.