

WORKSHEET #5, 9/11/07

MATH 54, FALL 2007

- (a) Consider the matrix $A = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$. Draw/describe what it does.
(c) Does it have an inverse? If so, find its inverse and draw/describe what it does.
 - Repeat problem 1 for the matrix $A = \begin{bmatrix} 1 & 0 \\ -3 & 1 \end{bmatrix}$.
 - Repeat problem 1 for the matrix $A = \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}$.
 - Repeat problem 1 for the matrix $A = \begin{bmatrix} -2 & 0 \\ 0 & 2 \end{bmatrix}$.
 - Repeat problem 1 for the matrix $A = \begin{bmatrix} \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \end{bmatrix}$.
 - Repeat problem 1 for the matrix $A = \begin{bmatrix} \frac{1}{\sqrt{2}} & -\frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \end{bmatrix}$.
 - Repeat problem 1 for the matrix $A = \begin{bmatrix} \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} & -\frac{1}{\sqrt{2}} \end{bmatrix}$.
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- (a) Write down the matrix for rotation counterclockwise by $\pi/6 = 30^\circ$.
(b) Write down the matrix for dilation by a factor of 10.
(c) How about the matrix for dilation by a factor of 10 followed by reflection about the x -axis?
(d) Write down the matrix for projection to the y -axis.
(e) How about the matrix for projection to the y -axis followed by reflection about the x -axis?
(f) How about the matrix for projection to the line spanned by the vector $\begin{bmatrix} 2 \\ 1 \end{bmatrix}$?
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- (a) How long is the vector $\begin{bmatrix} 1 \\ 1 \end{bmatrix}$? (Hint: Draw it and use the Pythagorean Theorem.)
(b) How long is the vector $\begin{bmatrix} 3 \\ 4 \end{bmatrix}$?
(c) How long is the vector $\begin{bmatrix} v_1 \\ v_2 \end{bmatrix}$?
(d) Go back and look at the matrices in 1–7. For each of them, decide whether it preserves the size of every vector. (That is, is $A\vec{v}$ the same size as \vec{v} for every $\vec{v} = \begin{bmatrix} v_1 \\ v_2 \end{bmatrix}$?)