Student: Lewis C	**Instructor:** Scott Fulton	**Assignment:** Section 2.7 Homework
Date: 05/11/20	**Course:** MA339 Applied Linear Algebra	

1. What 3×3 matrix will have the same effect on homogeneous coordinates for $\mathbb{R}^2$ that the shear matrix A has?

$$A = \begin{bmatrix} 1 & 0 \\ 0.25 & 1 \end{bmatrix}$$

The matrix that will have the same effect on the homogeneous coordinates for $\mathbb{R}^2$ as the shear matrix A is

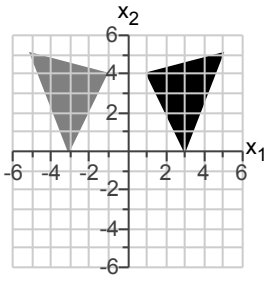
$$\begin{bmatrix} 1 & 0 & 0 \\ 0.25 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}.$$

2. Use matrix multiplication to find the image of the triangle with data matrix $D = \begin{bmatrix} -3 & -1 & -5 \\ 0 & 4 & 5 \end{bmatrix}$ under the transformation that reflects points through the y-axis. Sketch both the original triangle and its image.

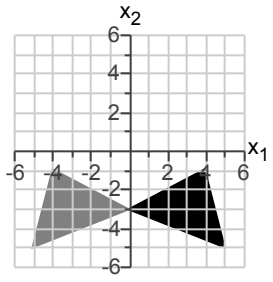
The matrix after the transformation is $\begin{bmatrix} 3 & 1 & 5 \\ 0 & 4 & 5 \end{bmatrix}$.

Sketch both the original triangle and its image. Which graph shows the original triangle and its image, where the original triangle is black and its image is gray?

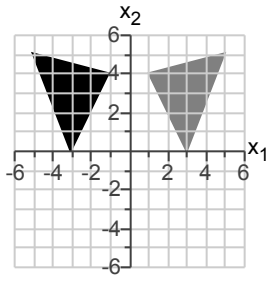
○ **A.**



○ **B.**



✓ **C.**



3. Find the 3×3 matrix that produces the described composite 2D transformation below, using homogeneous coordinates.

Translate by (2,6), and then rotate 45° about the origin.

The 3×3 matrix is $\begin{bmatrix} \frac{\sqrt{2}}{2} & -\frac{\sqrt{2}}{2} & -2\sqrt{2} \\ \frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{2} & 4\sqrt{2} \\ 0 & 0 & 1 \end{bmatrix}$.

(Type an exact answer, using radicals as needed.)

4. Find the 3×3 matrix that produces the described composite 2D transformation below, using homogeneous coordinates.

Translate by $(-5,3)$, and then scale the x-coordinate by 0.7 and the y-coordinate by 1.8.

The 3×3 matrix is $\begin{bmatrix} 0.7 & 0 & -3.5 \\ 0 & 1.8 & 5.4 \\ 0 & 0 & 1 \end{bmatrix}$.

(Type an exact answer, using radicals as needed.)

5. Find the 3×3 matrix that produces the described composite 2D transformation below, using homogeneous coordinates.

Rotate points 45°, and then reflect through the x- axis.

The 3×3 matrix is $\begin{bmatrix} \frac{\sqrt{2}}{2} & -\frac{\sqrt{2}}{2} & 0 \\ -\frac{\sqrt{2}}{2} & -\frac{\sqrt{2}}{2} & 0 \\ 0 & 0 & 1 \end{bmatrix}$.

(Type an exact answer, using radicals as needed.)

6. Find the 3×3 matrix that produces the described composite 2D transformation below, using homogeneous coordinates.

Rotate points through 60° about the point (3,8).

The 3×3 matrix is $\begin{bmatrix} \frac{1}{2} & -\frac{\sqrt{3}}{2} & \frac{3}{2}+4\sqrt{3} \\ \frac{\sqrt{3}}{2} & \frac{1}{2} & 4-\frac{3\sqrt{3}}{2} \\ 0 & 0 & 1 \end{bmatrix}$.

(Type exact answers, using radicals as needed.)

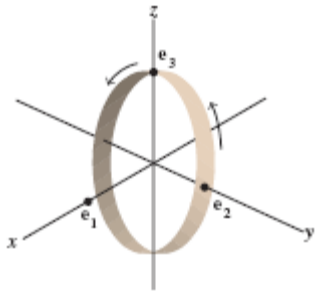
YOU ANSWERED: $\frac{-11\sqrt{3}}{2}-4$

$4\sqrt{3}-\frac{11}{2}$

7. What vector in $\mathbb{R}^3$ has homogeneous coordinates $\left(\frac{1}{3},-\frac{1}{6},\frac{1}{18},-\frac{1}{36}\right)$?

The corresponding point in $\mathbb{R}^3$ has coordinates $(\ -12\ ,\ 6\ ,\ -2\ )$. (Simplify your answer.)

8. Give the 4×4 matrix that rotates the points in $\mathbb{R}^3$ about the x- axis through an angle of 330°.



The 4×4 matrix that rotates the points in $\mathbb{R}^3$ about the x- axis through an angle of 330° is

$$A = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{3}}{2} & \frac{1}{2} & 0 \\ 0 & -\frac{1}{2} & \frac{\sqrt{3}}{2} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}.$$ (Type exact answers in simplified form.)