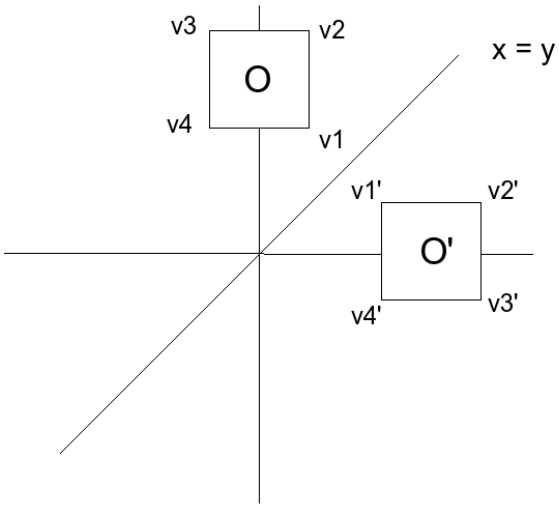
CS 371 – Exam Review Problem(s) – RP5 – Out Sept. 18, Due Before Class Sept. 20

1. We perform a rotation by 50 degrees about the point (3,1). To what point is the point (8, 9) transformed by such a rotation?

   (a) (-0.087, 9.974)
   (b) (0.087, 0.997)
   (c) (9.974, -0.087)
   (d) (0.087, 9.974)
   (e) (0.997, -0.087)



For questions 2 and 3, we wish to reflect the object labeled O in the above picture across the line x = y, resulting in the object O', with vertex v_i in O associated with vertex v_i' in O'.

2. Transformation A is comprised of a rotation by 45°, followed by a scale $(-1, 1)$, and finally a rotation by $-45°$. Transformation B is comprised of a rotation by 90°, which is then followed by a scale $(-1, 1)$. Which of the following choices is correct?

   (a) Only Transformation A achieves what is desired.
   (b) Only Transformation B achieves what is desired.
   (c) Both A and B achieve what is desired.
   (d) Neither A nor B achieve what is desired.

3. The six "magic numbers" – r_{xx} r_{xy} r_{yx} r_{yy} t_x t_y – that define this transformation are:

   (a) 0.0, 1.0, 1.0, 0.0, 1.0, 1.0
   (b) 1.0, 0.0, 0.0, 1.0, 1.0, 1.0
   (c) 0.0, 1.0, 1.0, 0.0, 0.0, 0.0
   (d) 1.0, 0.0, 0.0, 1.0, 0.0, 0.0
   (e) 1.0, 1.0, 0.0, 1.0, 1.0, 1.0

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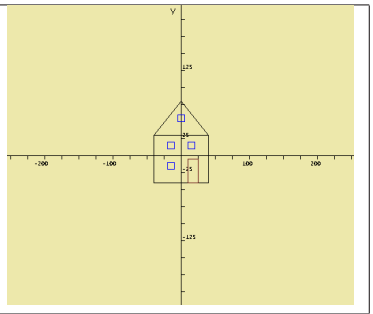
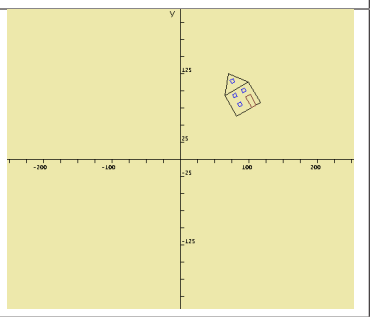
The next four questions refer to the images and matrix products below.

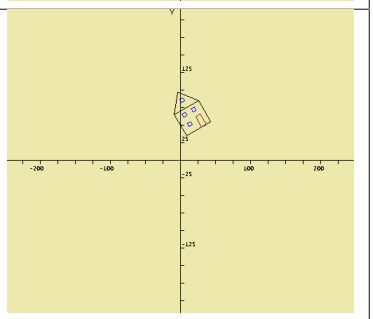
Original



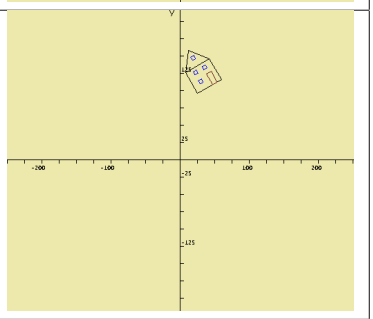
A



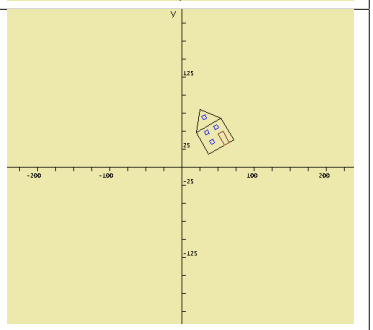
B



C



D



$$\begin{pmatrix} \frac{\sqrt{3}}{2} & -\frac{1}{2} & 0 \\ \frac{1}{2} & \frac{\sqrt{3}}{2} & 0 \\ 0 & 0 & 1 \end{pmatrix} \times \begin{pmatrix} 0.5 & 0 & 0 \\ 0 & 0.5 & 0 \\ 0 & 0 & 1 \end{pmatrix} \times \begin{pmatrix} 1 & 0 & 100 \\ 0 & 1 & 100 \\ 0 & 0 & 1 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 0 & 100 \\ 0 & 1 & 100 \\ 0 & 0 & 1 \end{pmatrix} \times \begin{pmatrix} \frac{\sqrt{3}}{2} & -\frac{1}{2} & 0 \\ \frac{1}{2} & \frac{\sqrt{3}}{2} & 0 \\ 0 & 0 & 1 \end{pmatrix} \times \begin{pmatrix} 0.5 & 0 & 0 \\ 0 & 0.5 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

4. Which of the following transformations is represented by the first matrix product above?

   (a) Scale by 0.5 0.5, then rotate by 30, then translate by 100 100
   (b) Translate by 100 100, the rotate by 30, then scale by 0.5 0.5
   (c) Translate by 100 100, then scale by 0.5 0.5, then rotate by 30
   (d) Rotate by 30, then scale by 0.5 0.5, then translate by 100 100
   (e) Scale by 0.5 0.5, then translate by 100 100, then rotate by 30
   (f) Rotate by 30, then translate by 100 100, then scale by 0.5 0.5

5. Which of the following transformations is represented by the second matrix product above?

   (a) Scale by 0.5 0.5, then rotate by 30, then translate by 100 100
   (b) Translate by 100 100, the rotate by 30, then scale by 0.5 0.5
   (c) Translate by 100 100, then scale by 0.5 0.5, then rotate by 30
   (d) Rotate by 30, then scale by 0.5 0.5, then translate by 100 100
   (e) Scale by 0.5 0.5, then translate by 100 100, then rotate by 30
   (f) Rotate by 30, then translate by 100 100, then scale by 0.5 0.5

6. Given the original image at the top left, which picture was produced by applying to that the original image the transformation in the first matrix product above?

   (a) A
   (b) B
   (c) C
   (d) D

7. Given the original image at the top left, which picture was produced by applying to that the original image the transformation in the second matrix product above?

   (a) A
   (b) B
   (c) C
   (d) D