+10 1. Perform the following matrix multiplication.

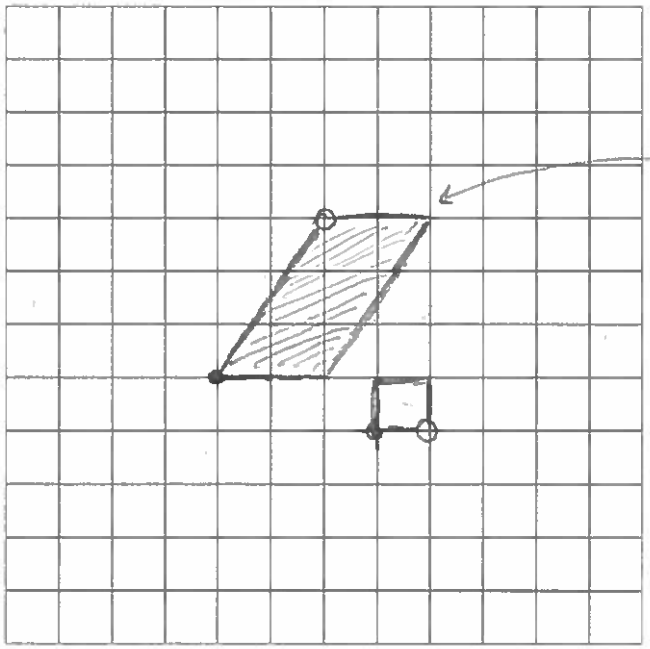
$$\begin{bmatrix} 3 & -1 \\ 2 & 4 \end{bmatrix} \begin{bmatrix} 1 & -3 \\ 2 & 1 \end{bmatrix}$$

$$\begin{bmatrix} 3\cdot 1 + (-1)\cdot 2 & 3(-3) - 1\cdot 1 \\ 2\cdot 1 + 4\cdot 2 & 2(-3) + 4\cdot 1 \end{bmatrix} = \begin{bmatrix} 1 & -10 \\ 10 & -2 \end{bmatrix}$$

+10 2. For the following transformation, sketch a diagram of the unit square (with filled-in and open circles as in class) and the parallelogram it transforms into (possibly shaded if there is a flip).

$$T\begin{pmatrix} x \\ y \end{pmatrix} = \begin{bmatrix} 2 & 2 \\ 3 & 0 \end{bmatrix} \begin{pmatrix} x \\ y \end{pmatrix} + \begin{pmatrix} -3 \\ 1 \end{pmatrix}.$$

+5 Also, check your sketch by algebraically evaluating $T\begin{pmatrix} 1 \\ 1 \end{pmatrix}$ and interpreting the result.

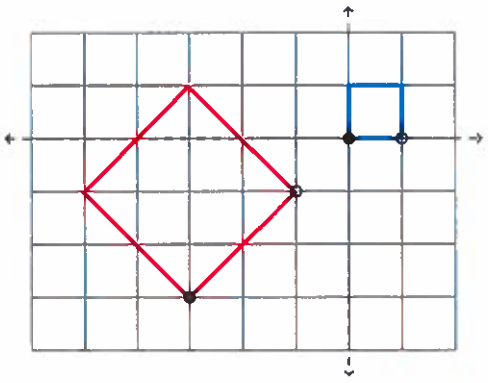


Has coordinates $\begin{pmatrix} 1 \\ 4 \end{pmatrix}$, as calculated below.

$$T\begin{pmatrix} 1 \\ 1 \end{pmatrix} = \begin{bmatrix} 2 & 2 \\ 3 & 0 \end{bmatrix} \begin{pmatrix} 1 \\ 1 \end{pmatrix} + \begin{pmatrix} -3 \\ 1 \end{pmatrix} = \begin{pmatrix} 4 \\ 3 \end{pmatrix} + \begin{pmatrix} -3 \\ 1 \end{pmatrix} = \begin{pmatrix} 1 \\ 4 \end{pmatrix}$$

+15

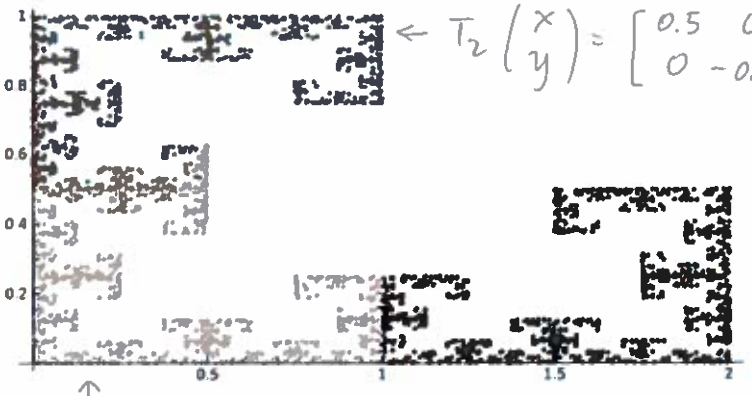
3. Write the transformation which takes the unit square (blue) to the transformed square (red).



$$T\begin{pmatrix} x \\ y \end{pmatrix} = \begin{bmatrix} 2 & -2 \\ 2 & 2 \end{bmatrix}\begin{pmatrix} x \\ y \end{pmatrix} + \begin{pmatrix} -3 \\ -3 \end{pmatrix}$$

+20

4. What transformations would you need to describe the following fractal using an iterated function system? Be sure to indicate which transformation goes with which part of the fractal. Use appropriate notation (such as that used for T in #2).



$$T_2\begin{pmatrix} x \\ y \end{pmatrix} = \begin{bmatrix} 0.5 & 0 \\ 0 & -0.5 \end{bmatrix}\begin{pmatrix} x \\ y \end{pmatrix} + \begin{pmatrix} 0 \\ 1 \end{pmatrix}$$

$$T_1\begin{pmatrix} x \\ y \end{pmatrix} = \begin{bmatrix} 0.5 & 0 \\ 0 & 0.5 \end{bmatrix}\begin{pmatrix} x \\ y \end{pmatrix}$$

$$T_3\begin{pmatrix} x \\ y \end{pmatrix} = \begin{bmatrix} -0.5 & 0 \\ 0 & 0.5 \end{bmatrix}\begin{pmatrix} x \\ y \end{pmatrix} + \begin{pmatrix} 2 \\ 0 \end{pmatrix}$$