Pre-class exercise

• The transformation matrix $T$ maps coordinates from an input image to an output image:

$$
\begin{bmatrix}
  x \\
  y \\
  1
\end{bmatrix} =
\begin{bmatrix}
  u \\
  v \\
  1
\end{bmatrix} T =
\begin{bmatrix}
  t_{11} & t_{12} & 0 \\
  t_{21} & t_{22} & 0 \\
  t_{31} & t_{32} & 1
\end{bmatrix}
$$

where $(u,v)$ are the coordinates in the input image, and $(x,y)$ are the coordinates in the output image.

• Write $T$ to implement each of the following transformations:
  – The output image is expanded (scaled) by a factor of 1.5
  – The output image is translated to the right by 10 pixels
  – The output image is rotated clockwise by 30 degrees