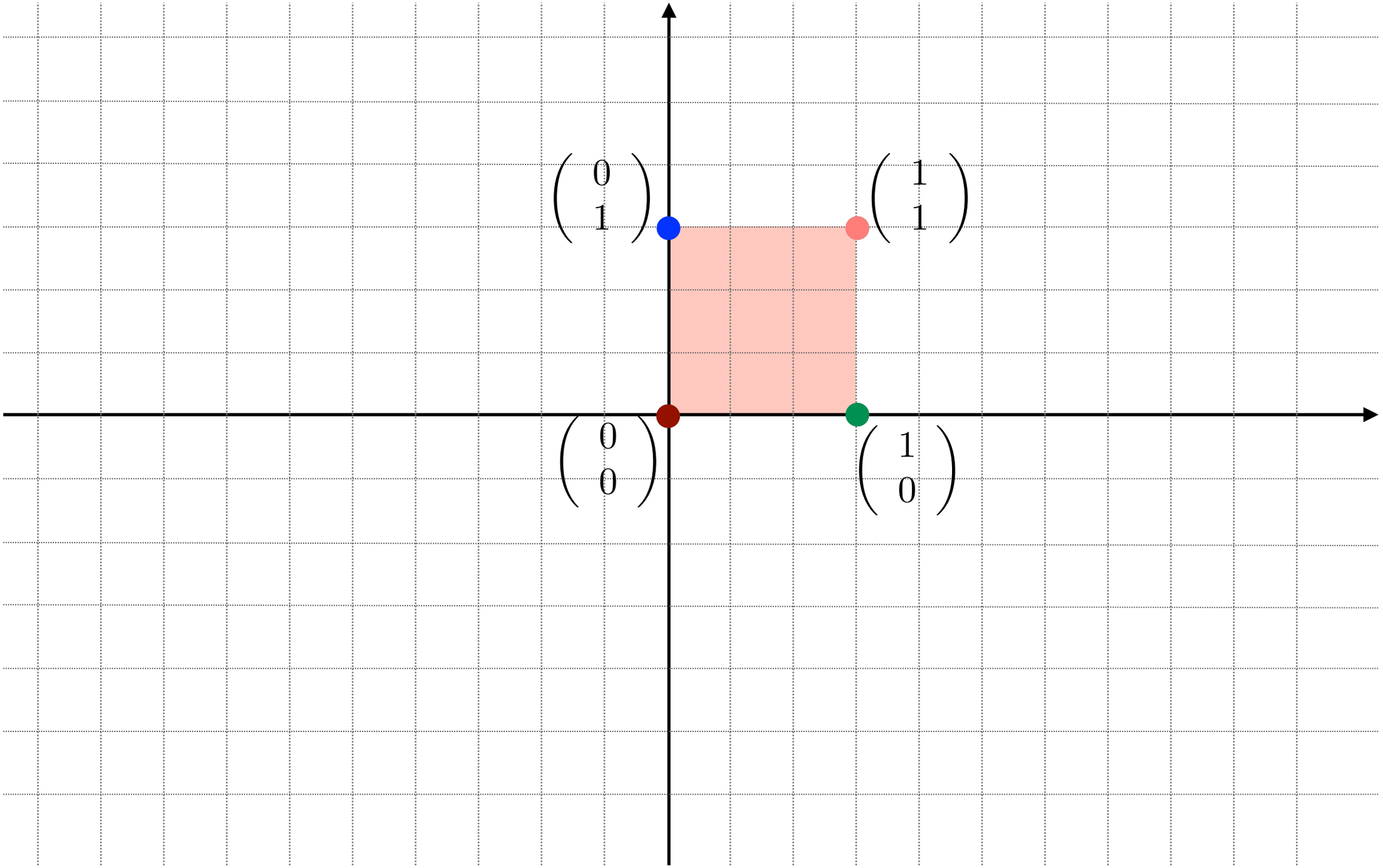
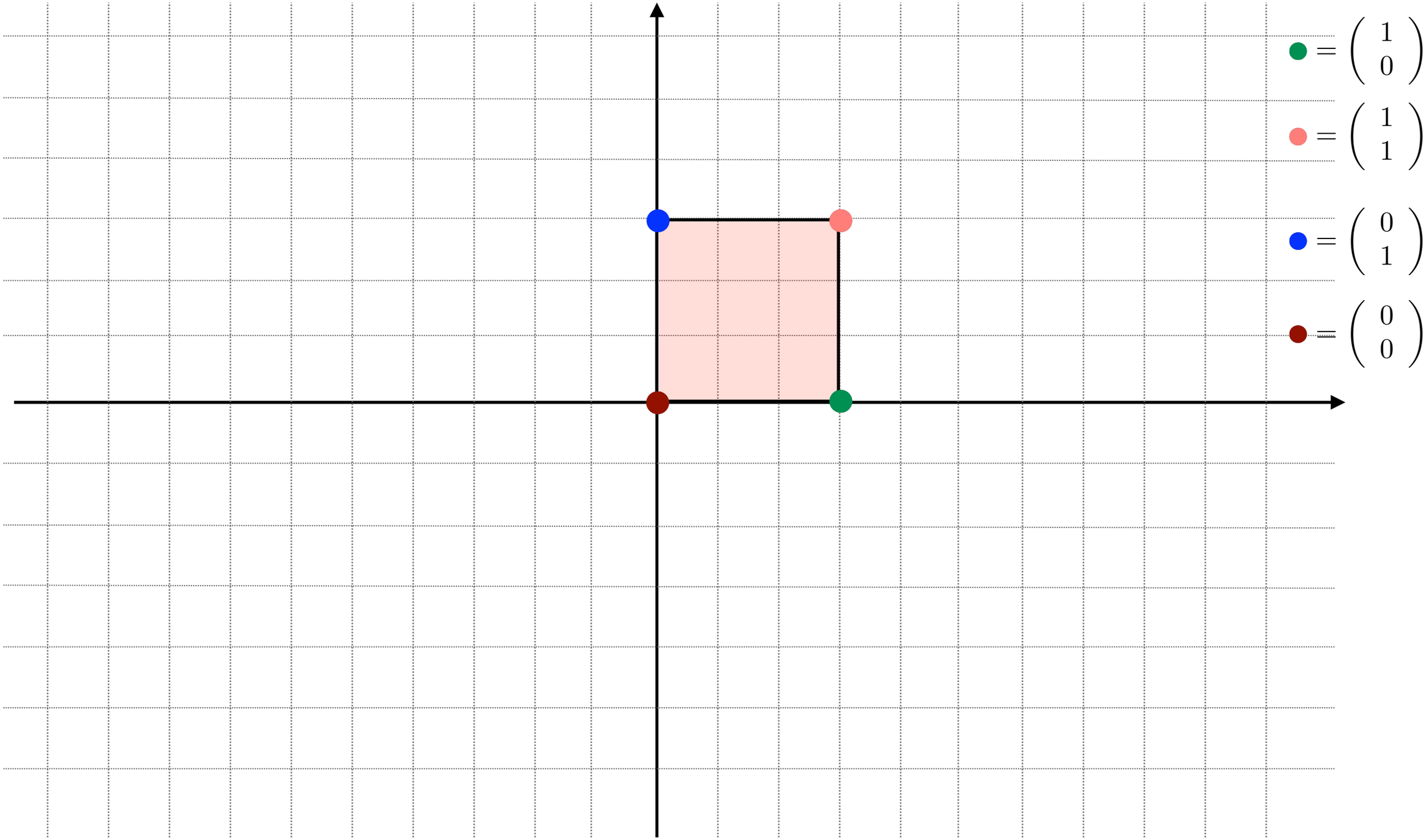
# Applications linéaires

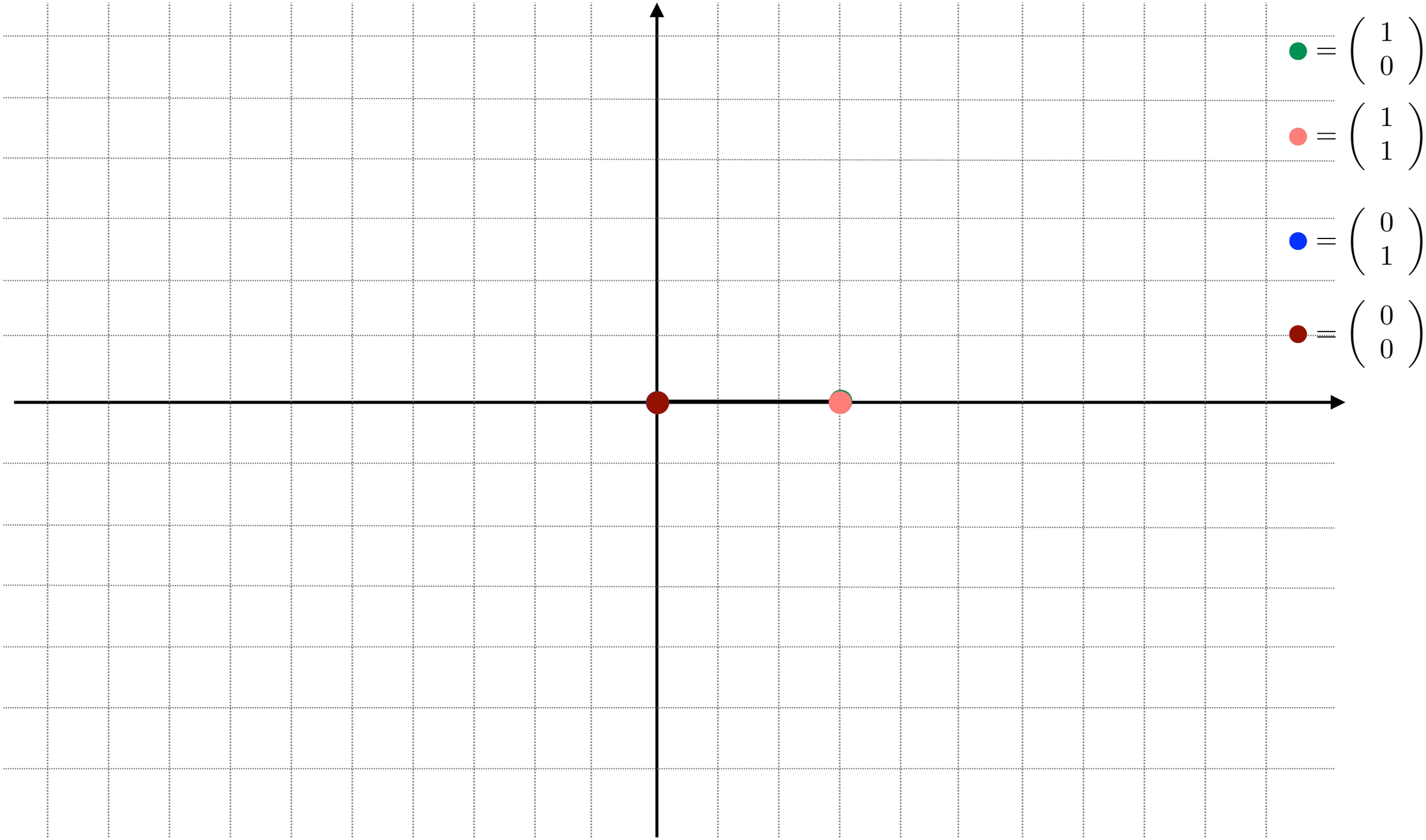
# Transformations linéaires du plan



# Projection sur l'axe horizontale

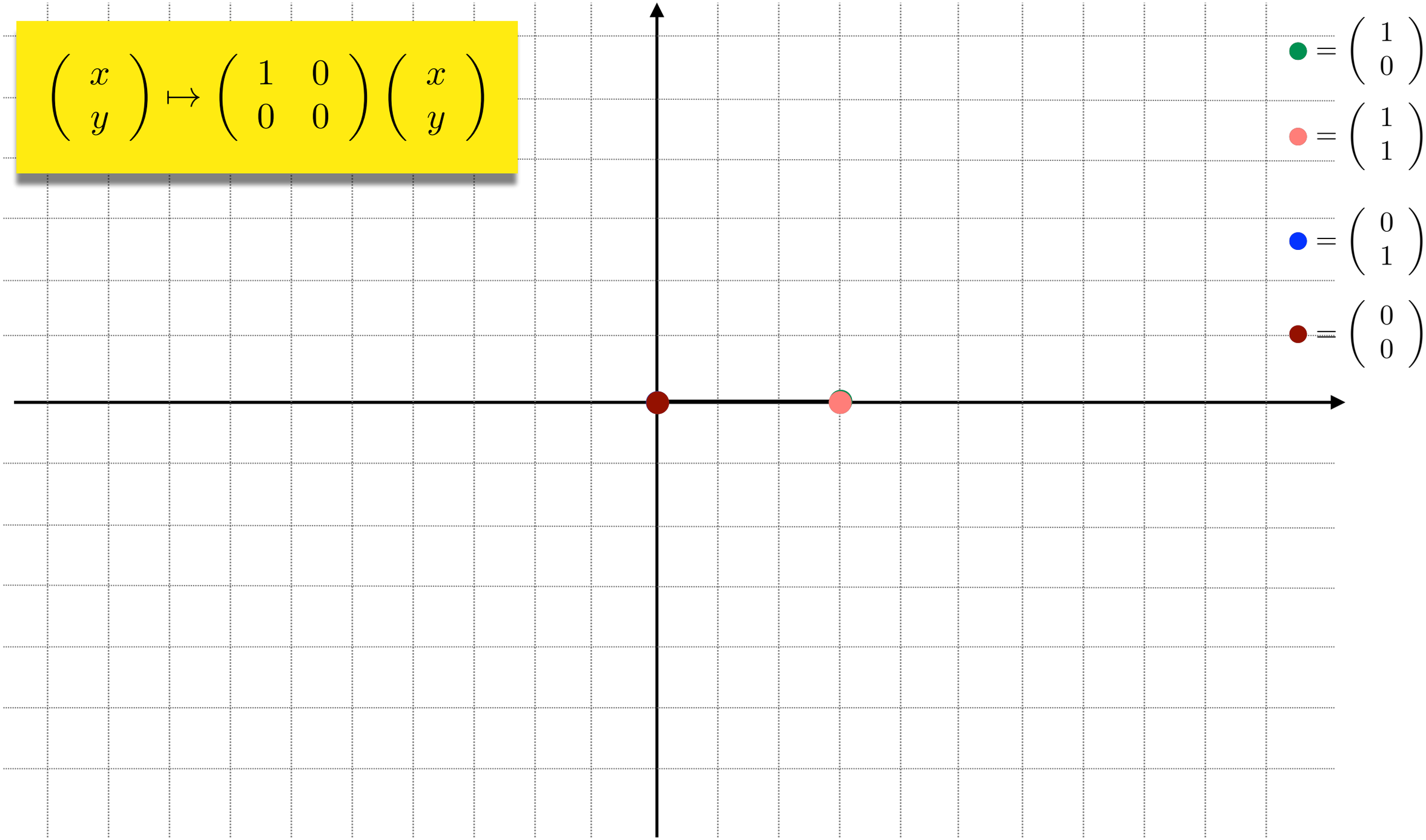


# Projection sur l'axe horizontale

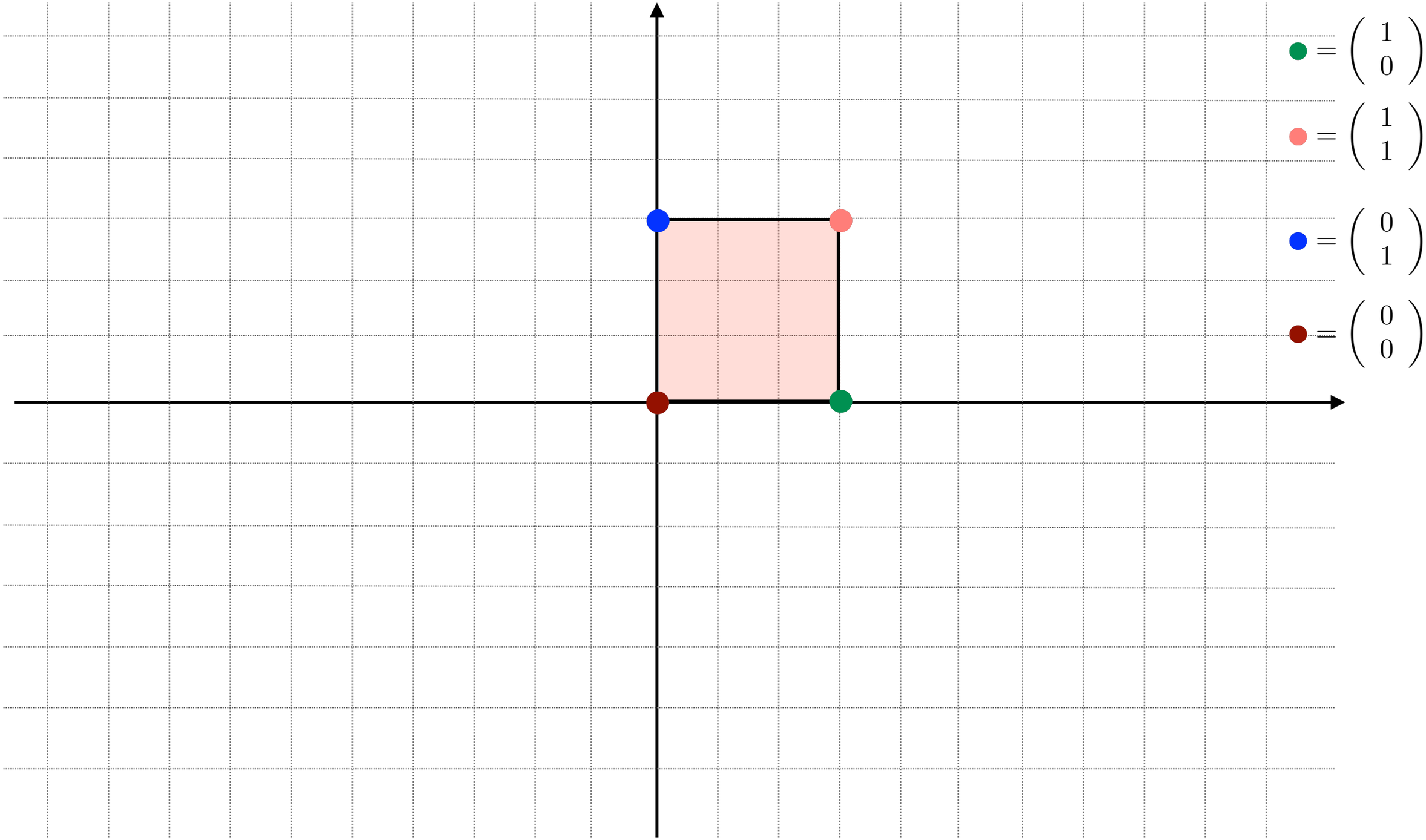


# Projection sur l'axe horizontale

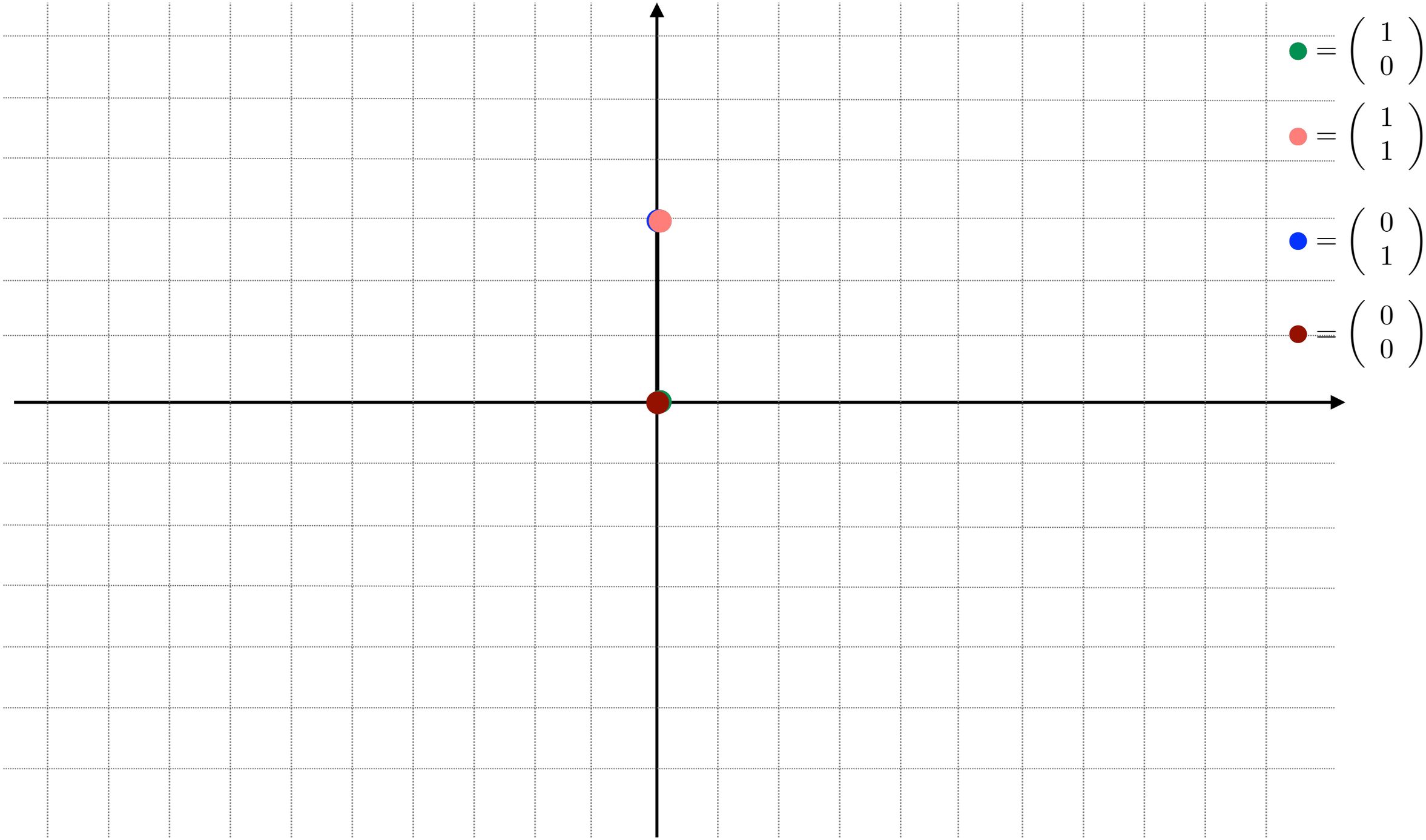
$$\begin{pmatrix} x \\ y \end{pmatrix} \mapsto \begin{pmatrix} 1 & 0 \\ 0 & 0 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$$



# Projection sur l'axe verticale

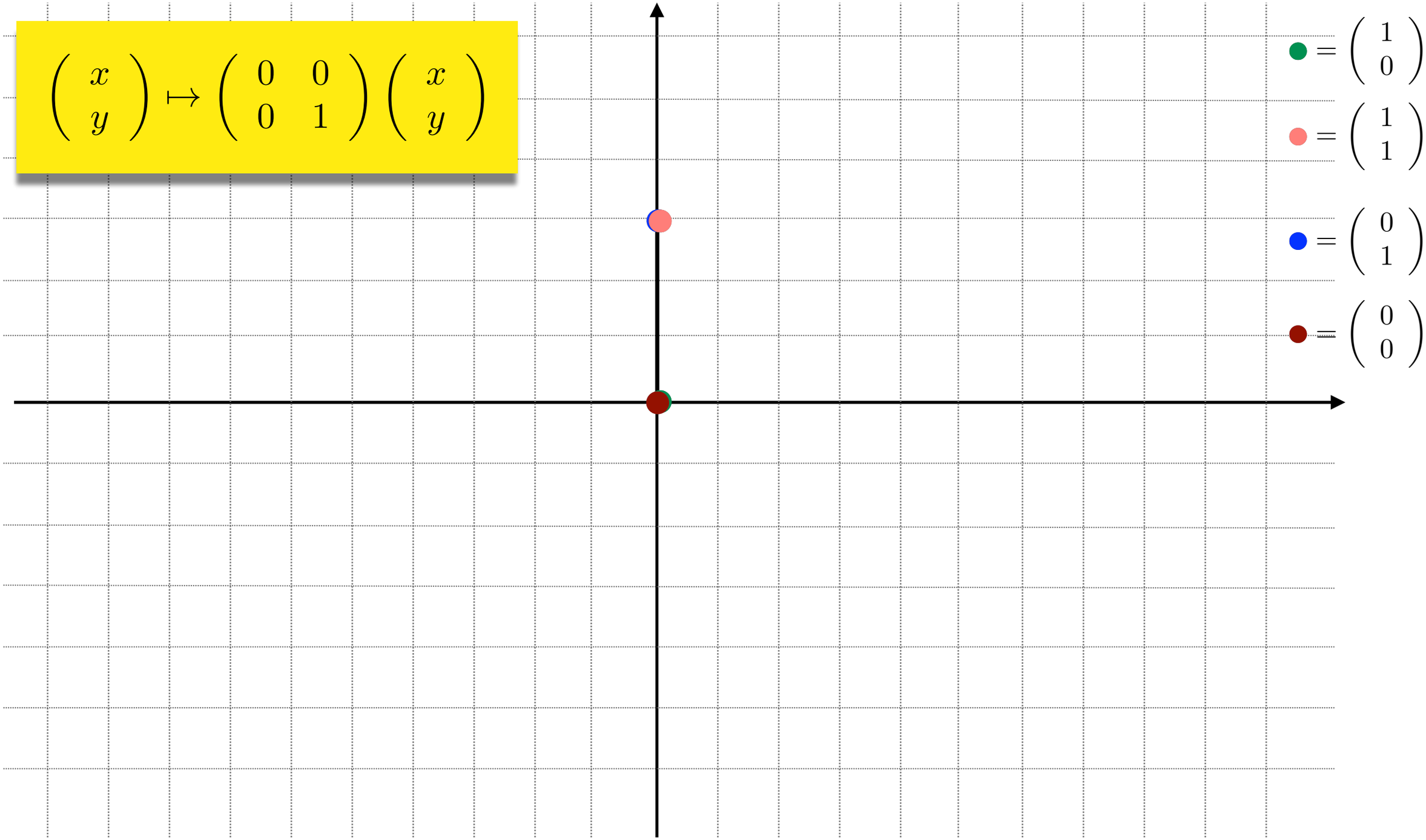


# Projection sur l'axe verticale

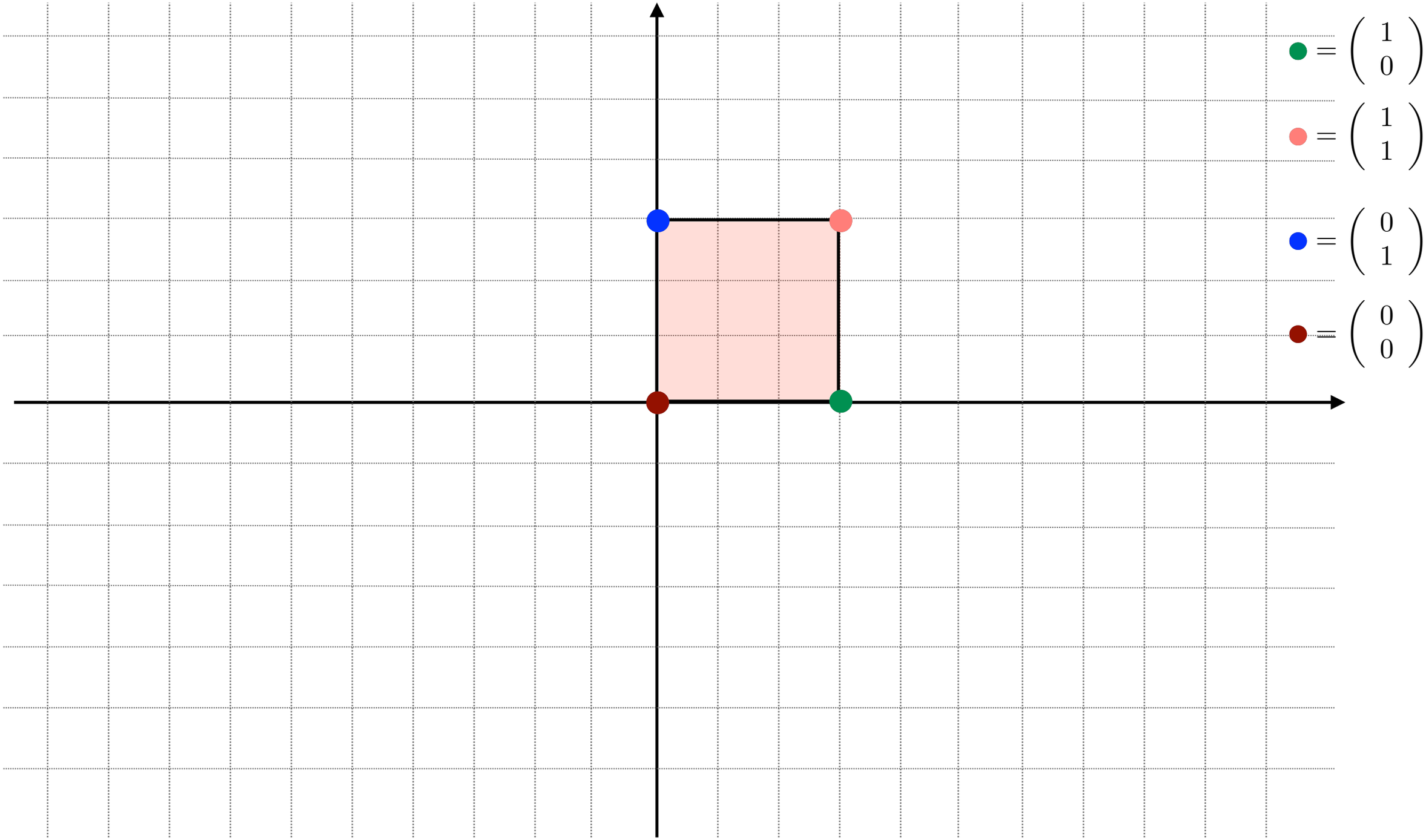


# Projection sur l'axe verticale

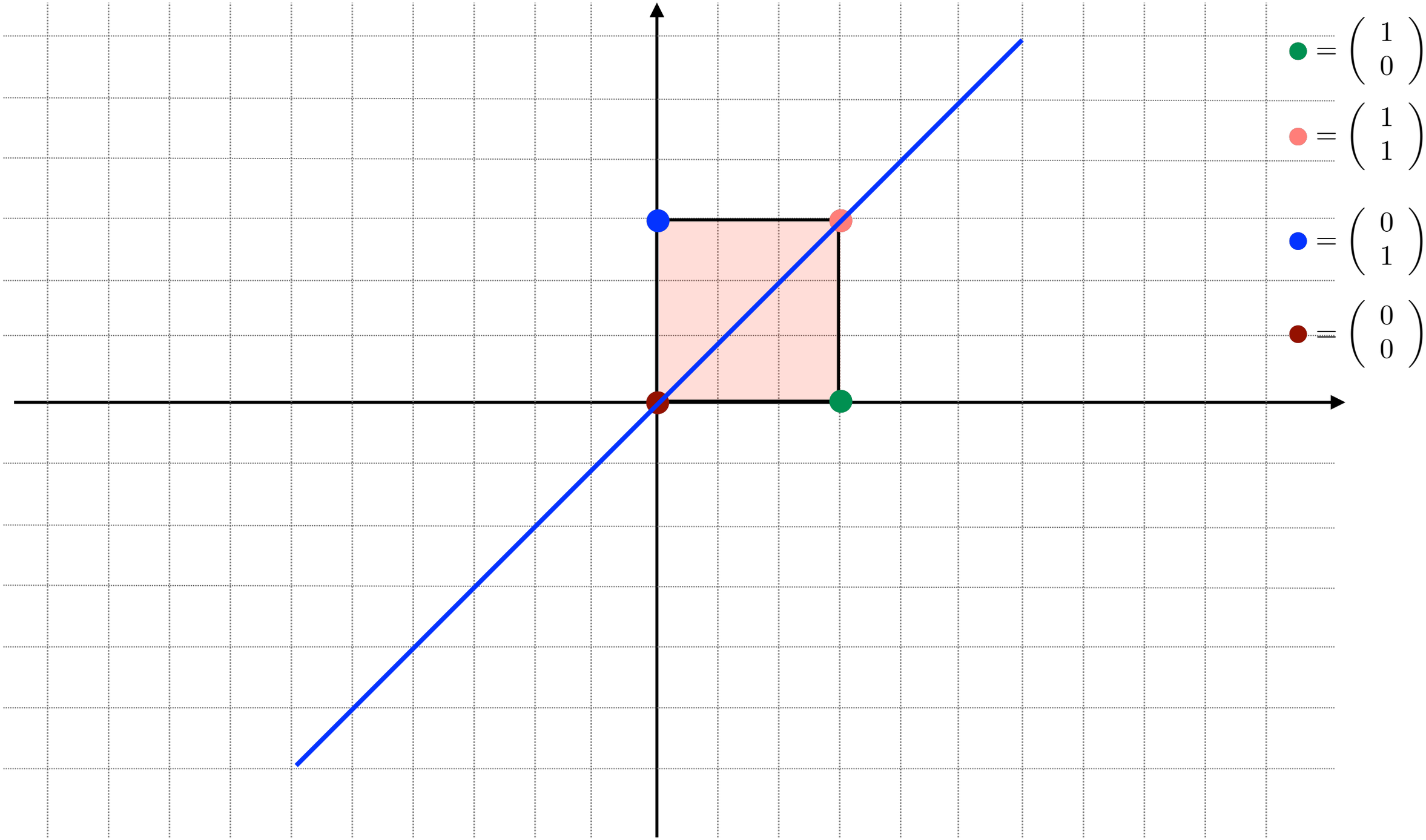
$$\begin{pmatrix} x \\ y \end{pmatrix} \mapsto \begin{pmatrix} 0 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$$



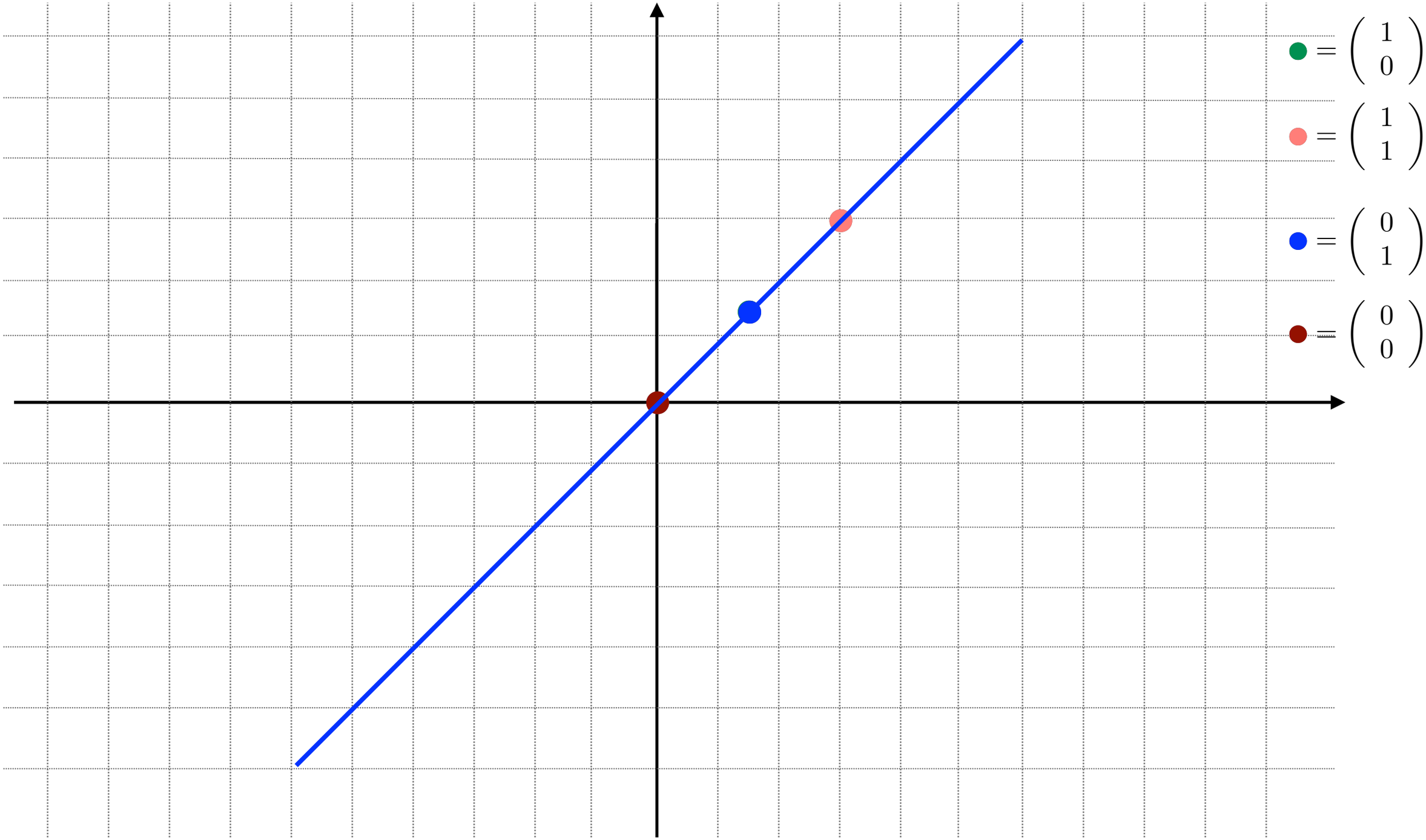
# Projection sur la droite y=x



# Projection sur la droite y=x

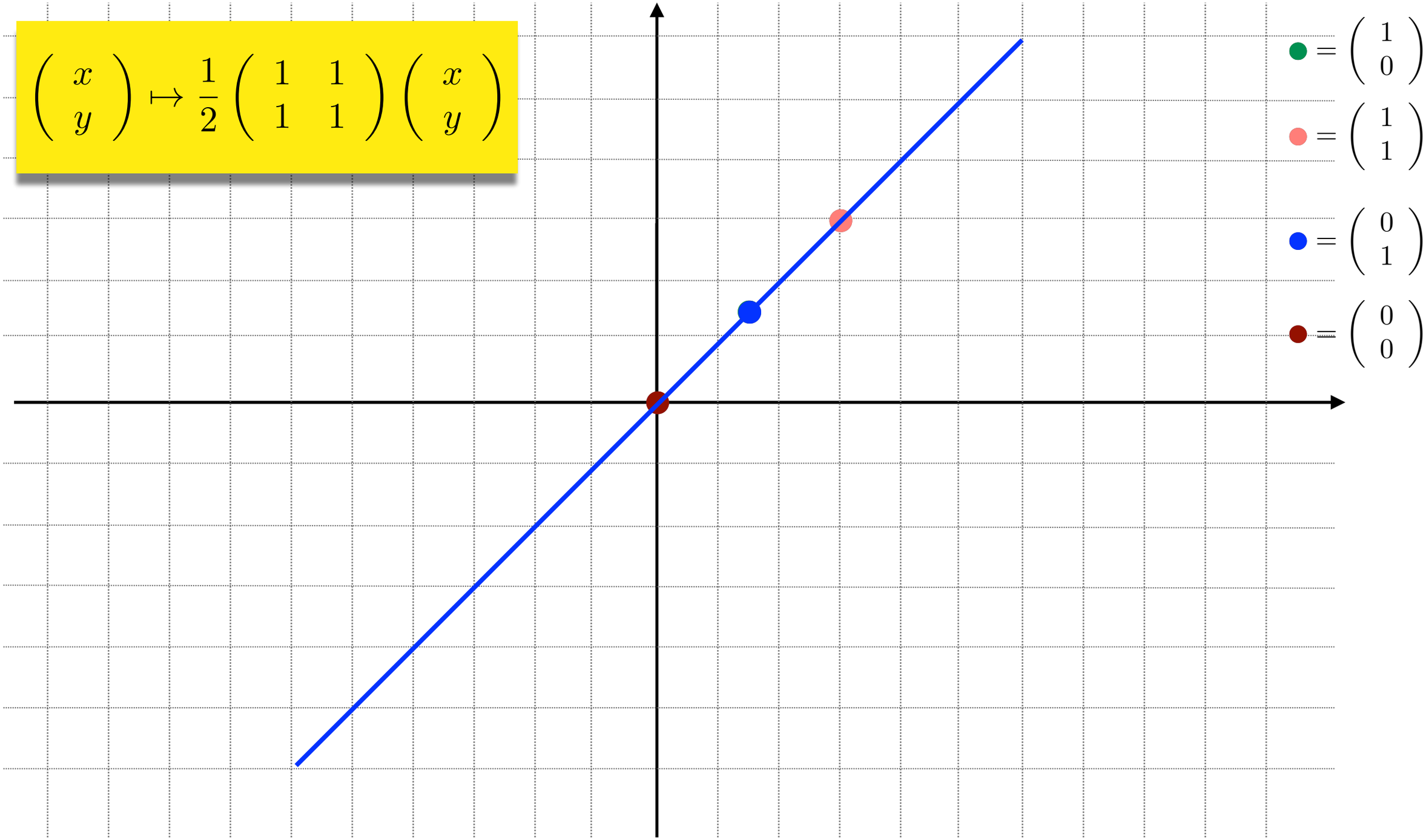


# Projection sur la droite y=x

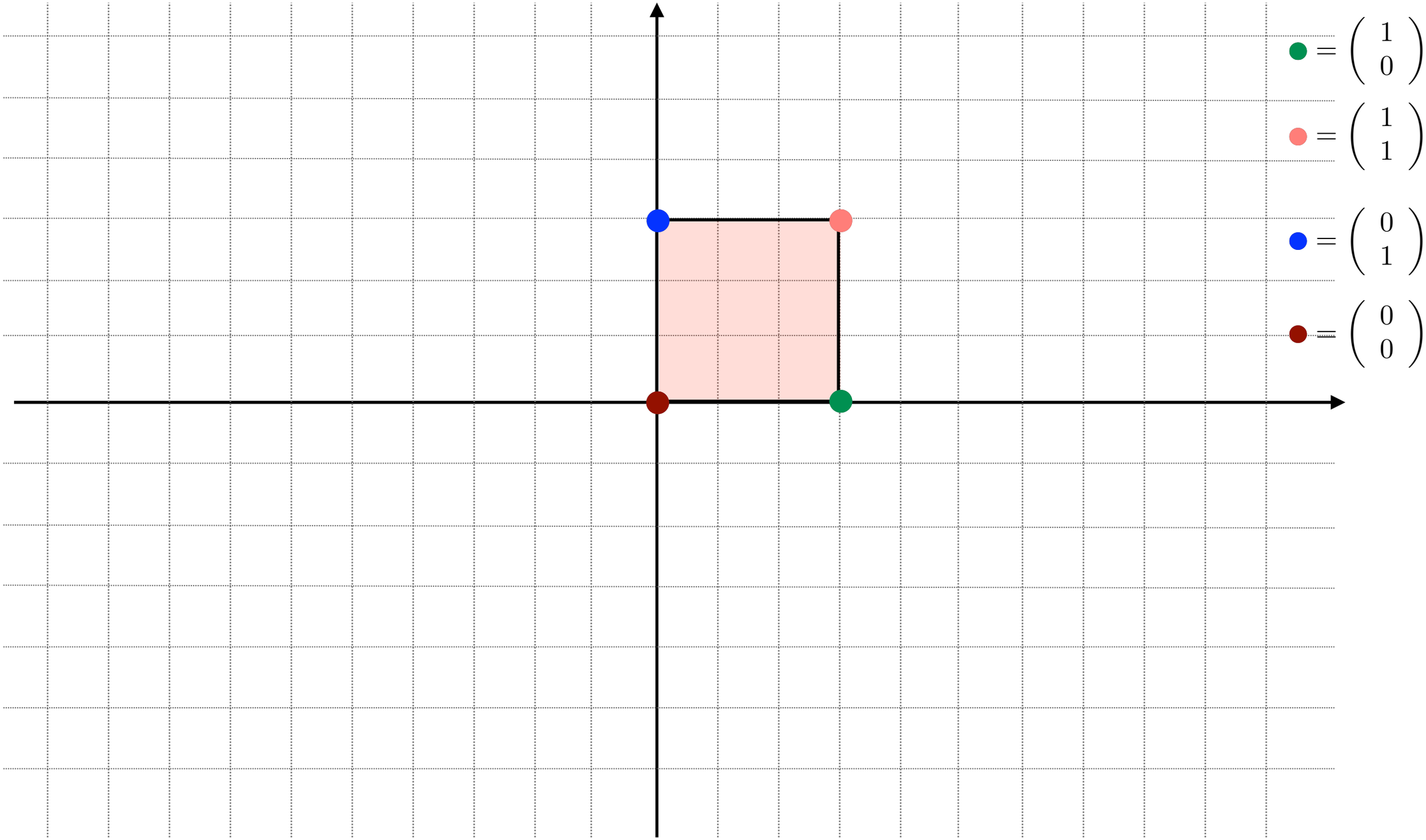


# Projection sur la droite y=x

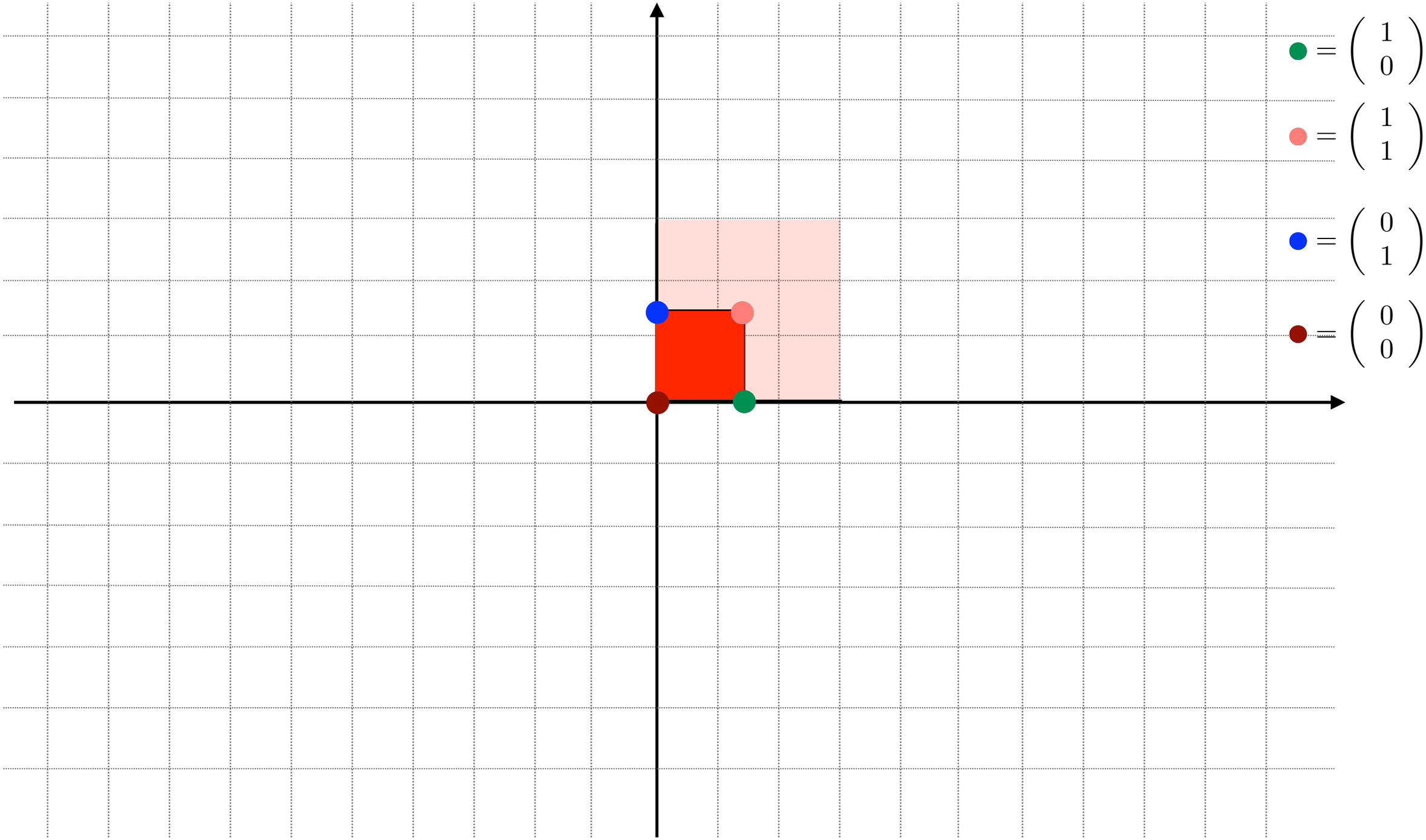
$$\begin{pmatrix} x \\ y \end{pmatrix} \mapsto \frac{1}{2}\begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix}$$



# Contraction



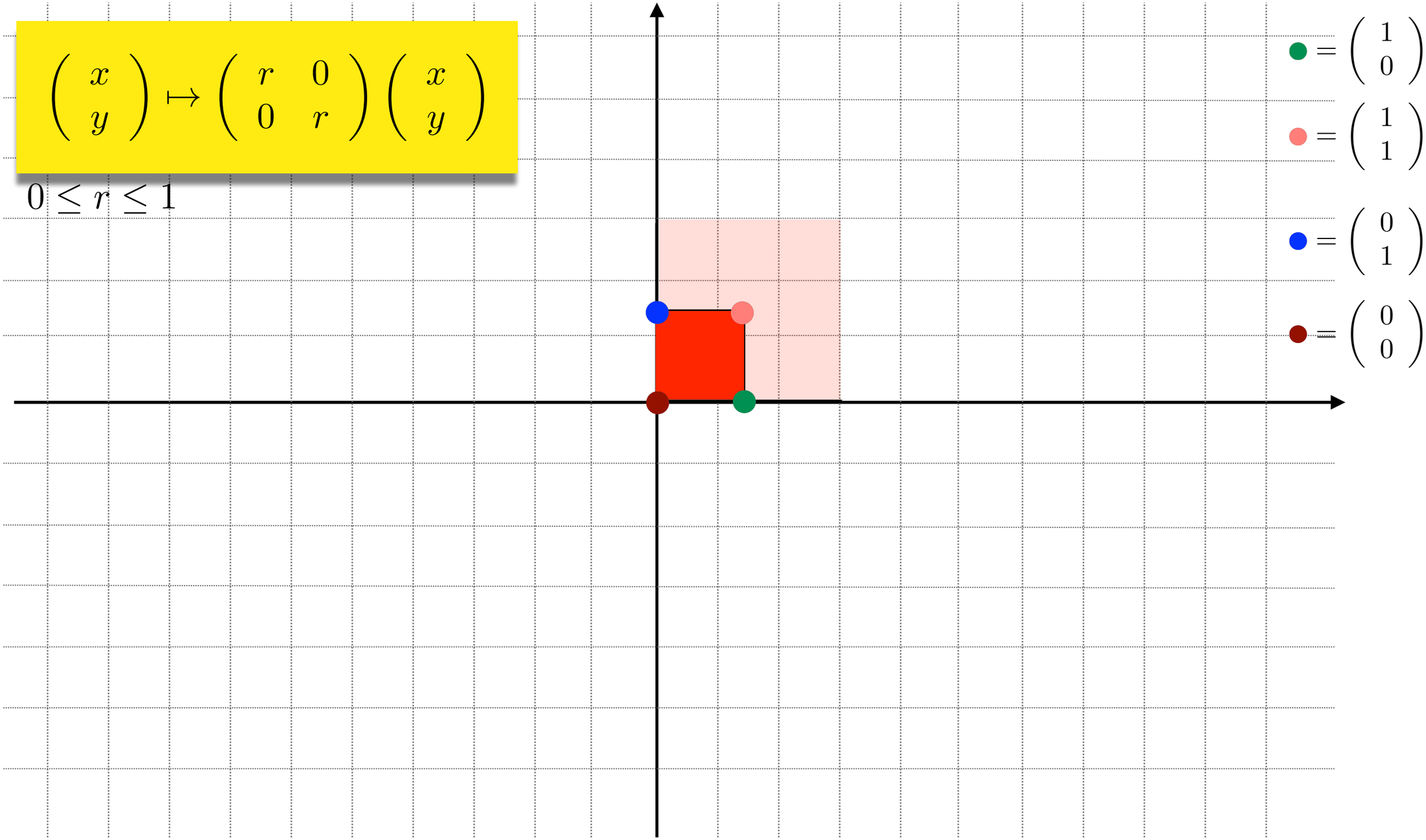
# Contraction



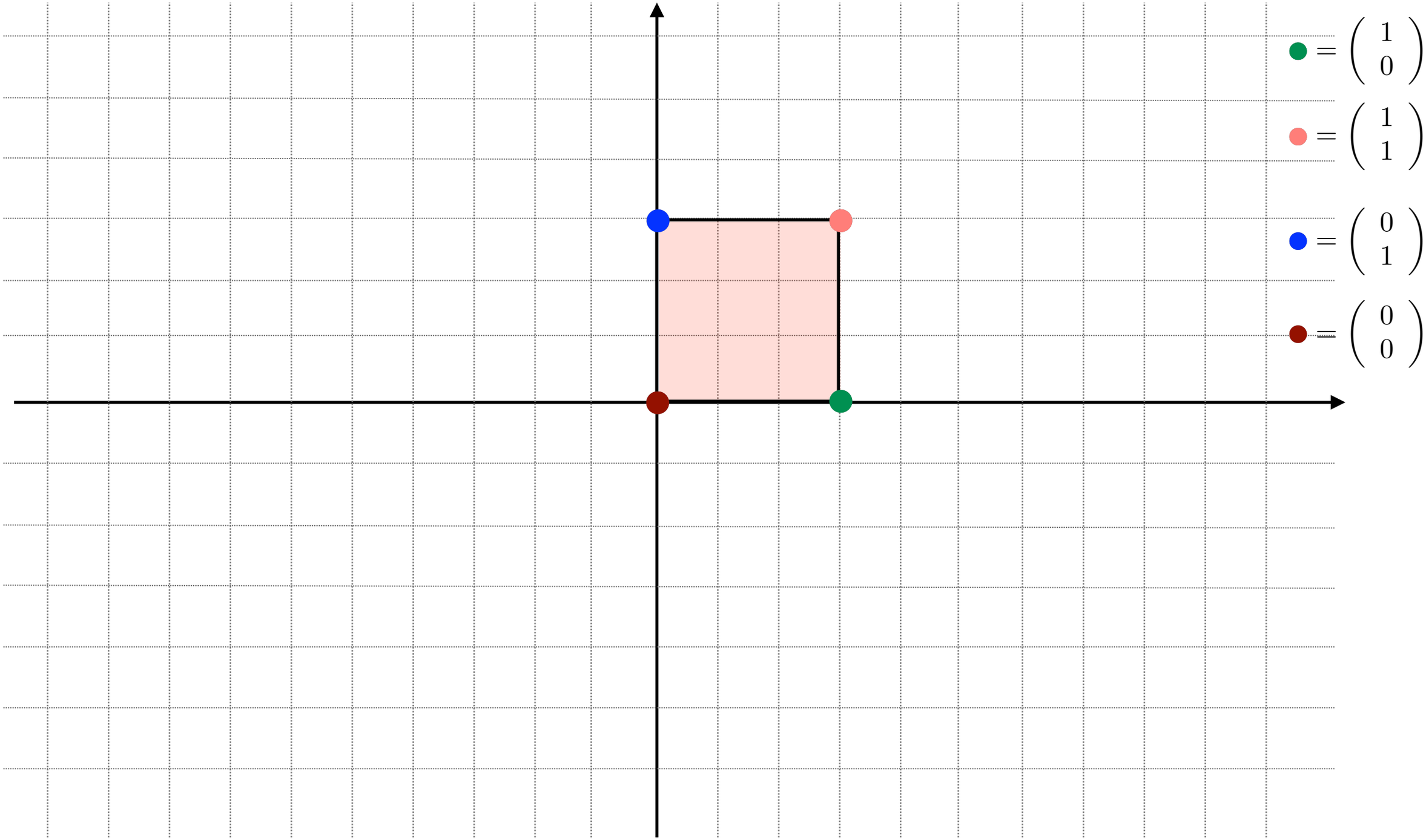
# Contraction

$$\begin{pmatrix} x \\ y \end{pmatrix} \mapsto \begin{pmatrix} r & 0 \\ 0 & r \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$$

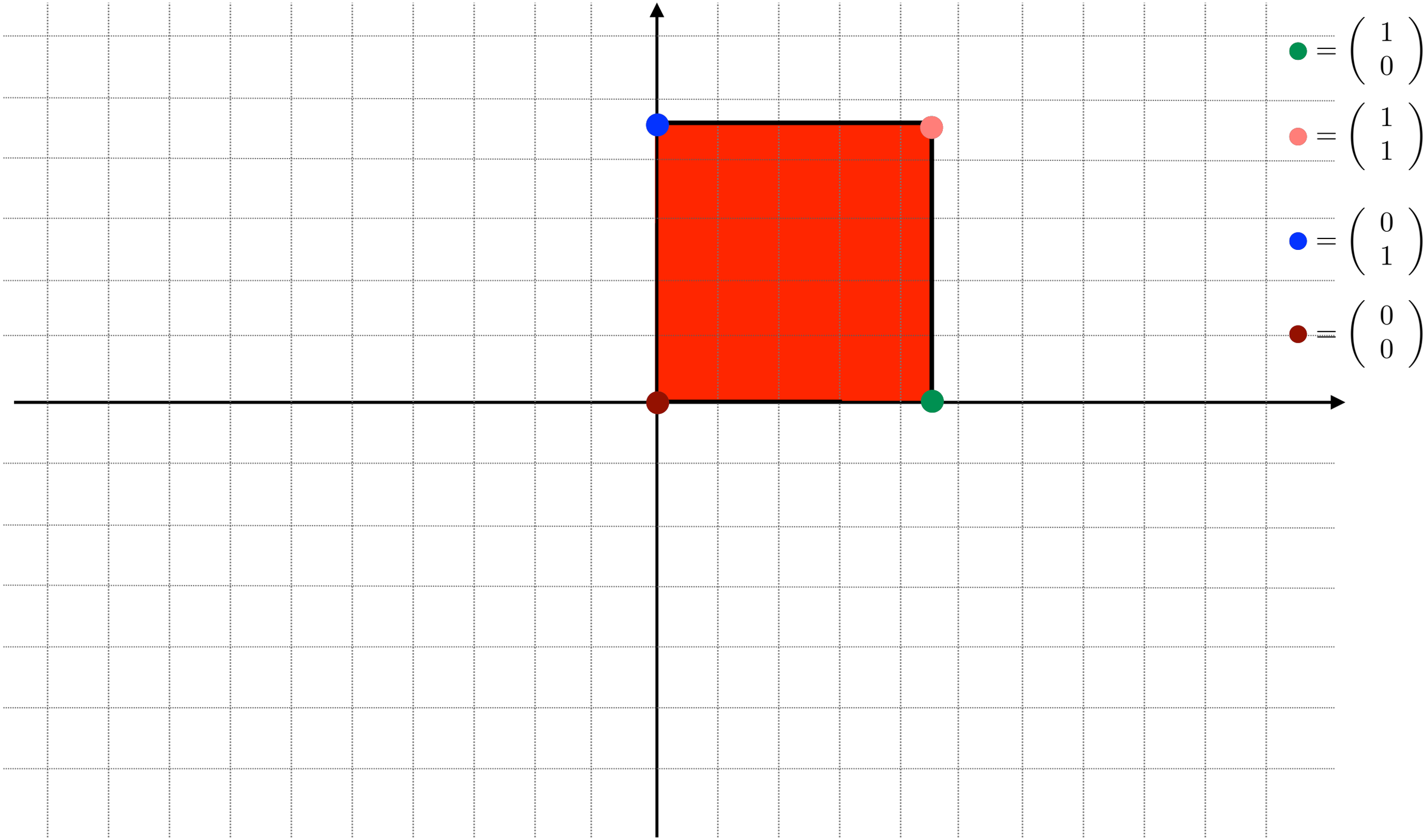
$0 \leq r \leq 1$



# Dilation


$= \begin{pmatrix} 1 \\ 0 \end{pmatrix}$
$= \begin{pmatrix} 1 \\ 1 \end{pmatrix}$
$= \begin{pmatrix} 0 \\ 1 \end{pmatrix}$
$= \begin{pmatrix} 0 \\ 0 \end{pmatrix}$

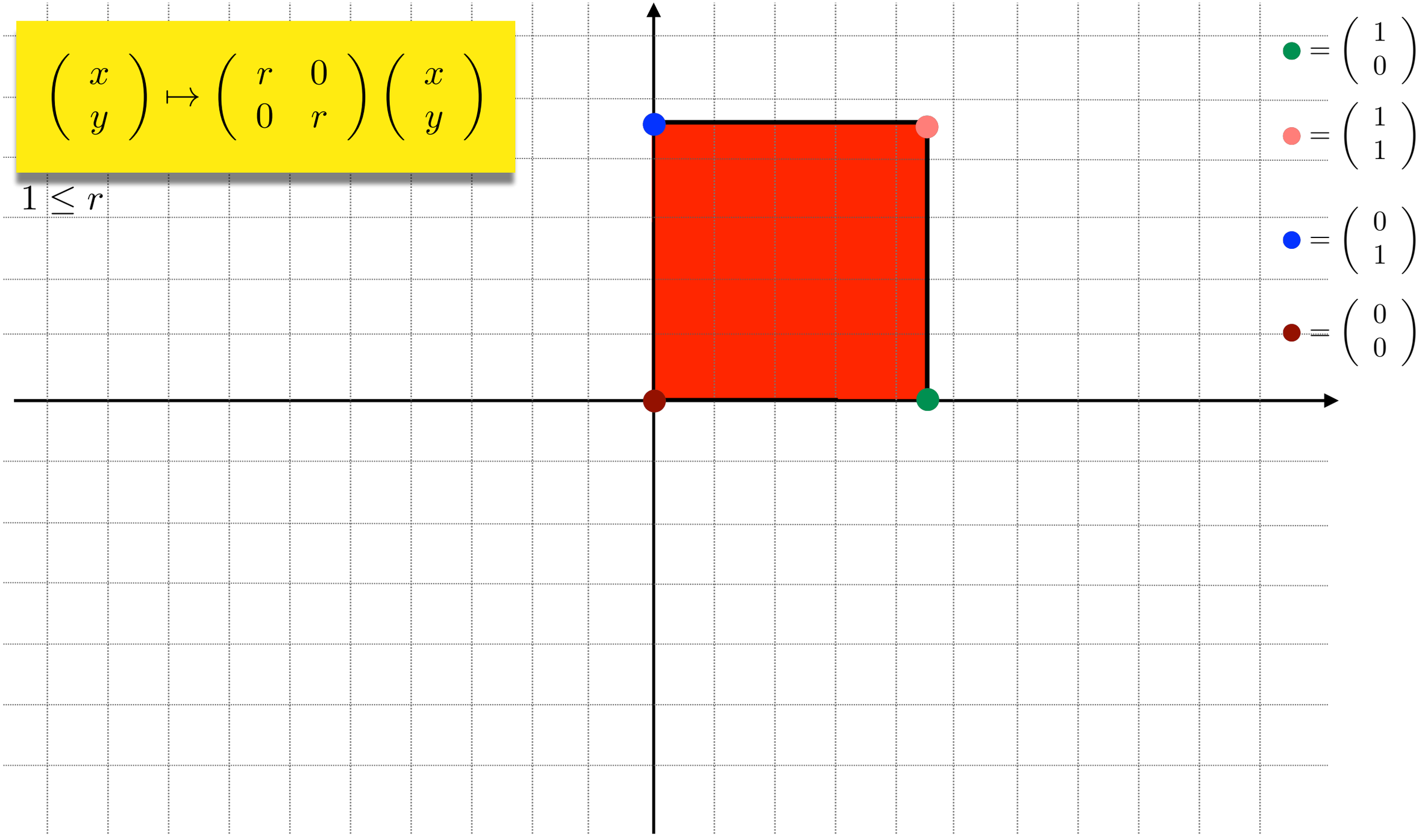
# Dilation


$= \begin{pmatrix} 1 \\ 0 \end{pmatrix}$
$= \begin{pmatrix} 1 \\ 1 \end{pmatrix}$
$= \begin{pmatrix} 0 \\ 1 \end{pmatrix}$
$= \begin{pmatrix} 0 \\ 0 \end{pmatrix}$

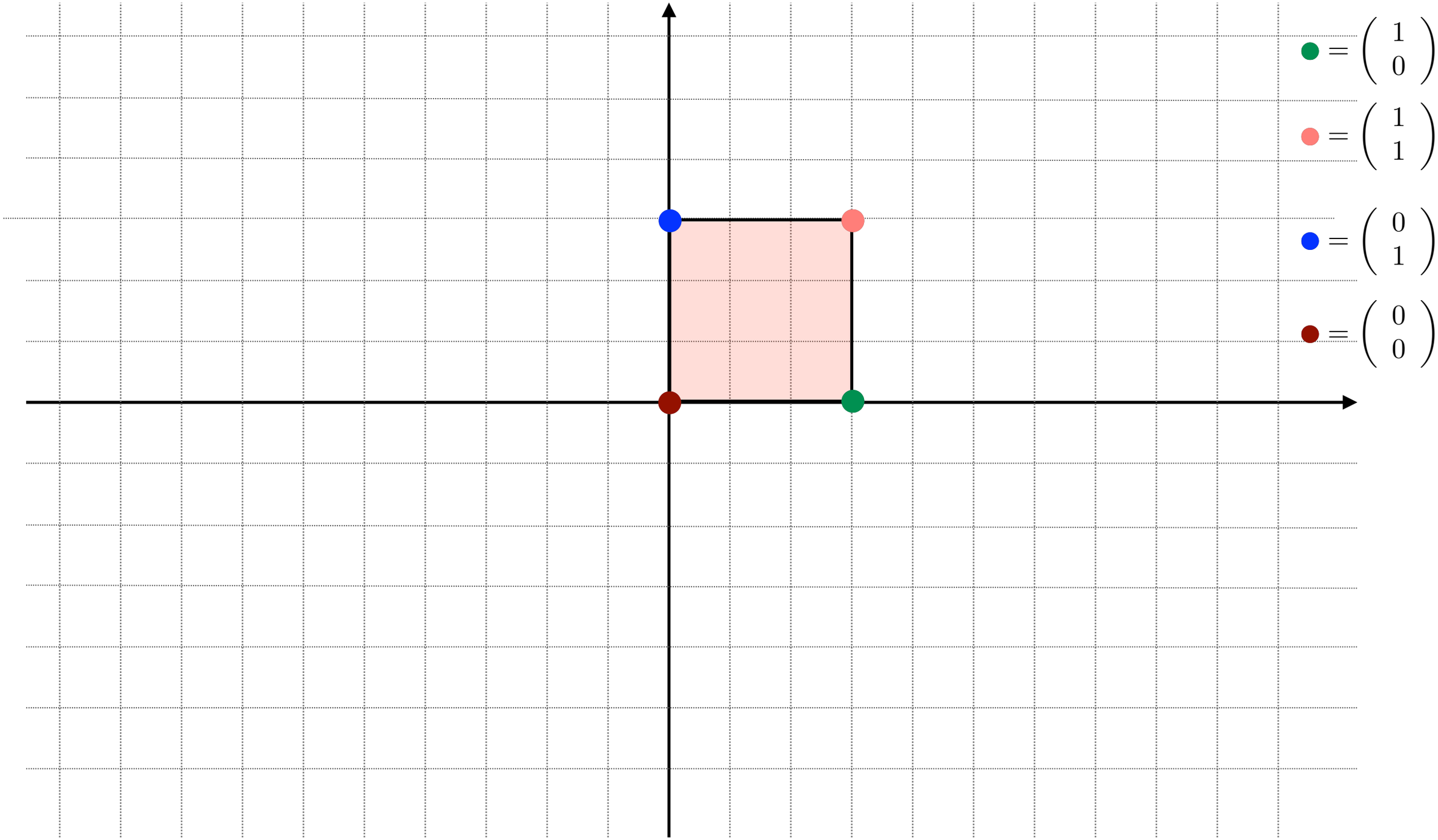
# Dilation

$$\begin{pmatrix} x \\ y \end{pmatrix} \mapsto \begin{pmatrix} r & 0 \\ 0 & r \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$$

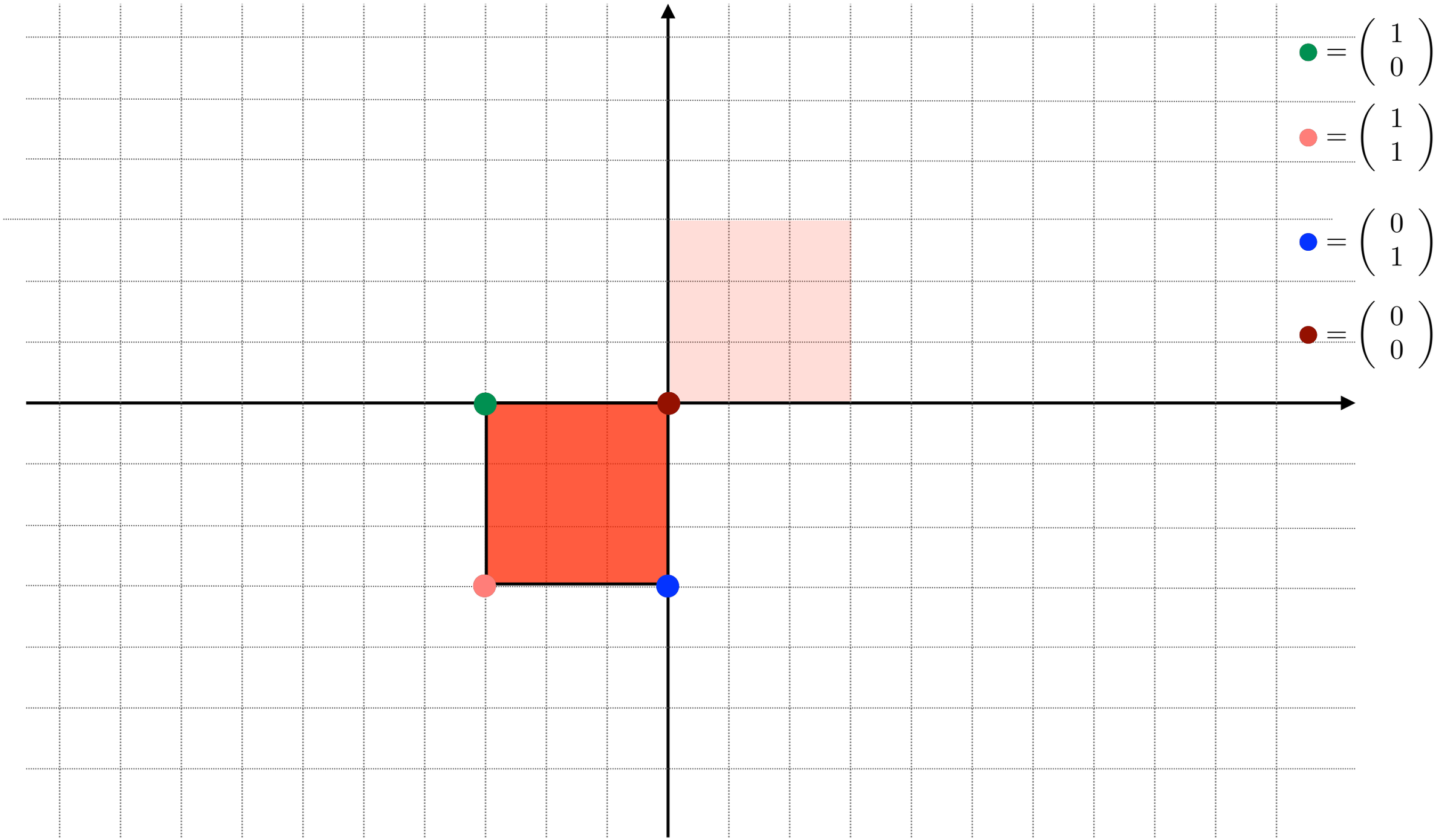
$1 \leq r$



# Réflexion par (0,0)

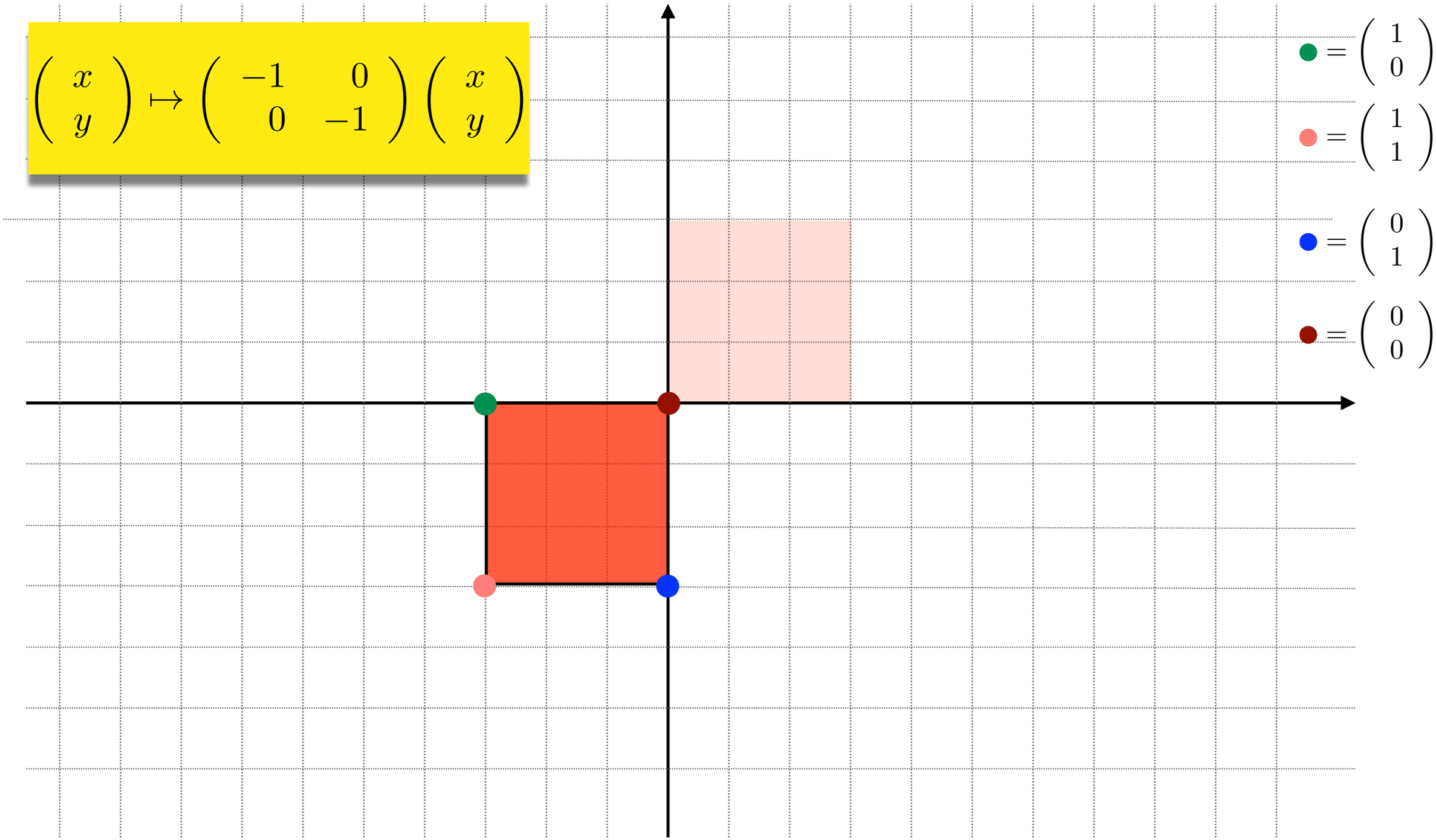


# Réflexion par (0,0)

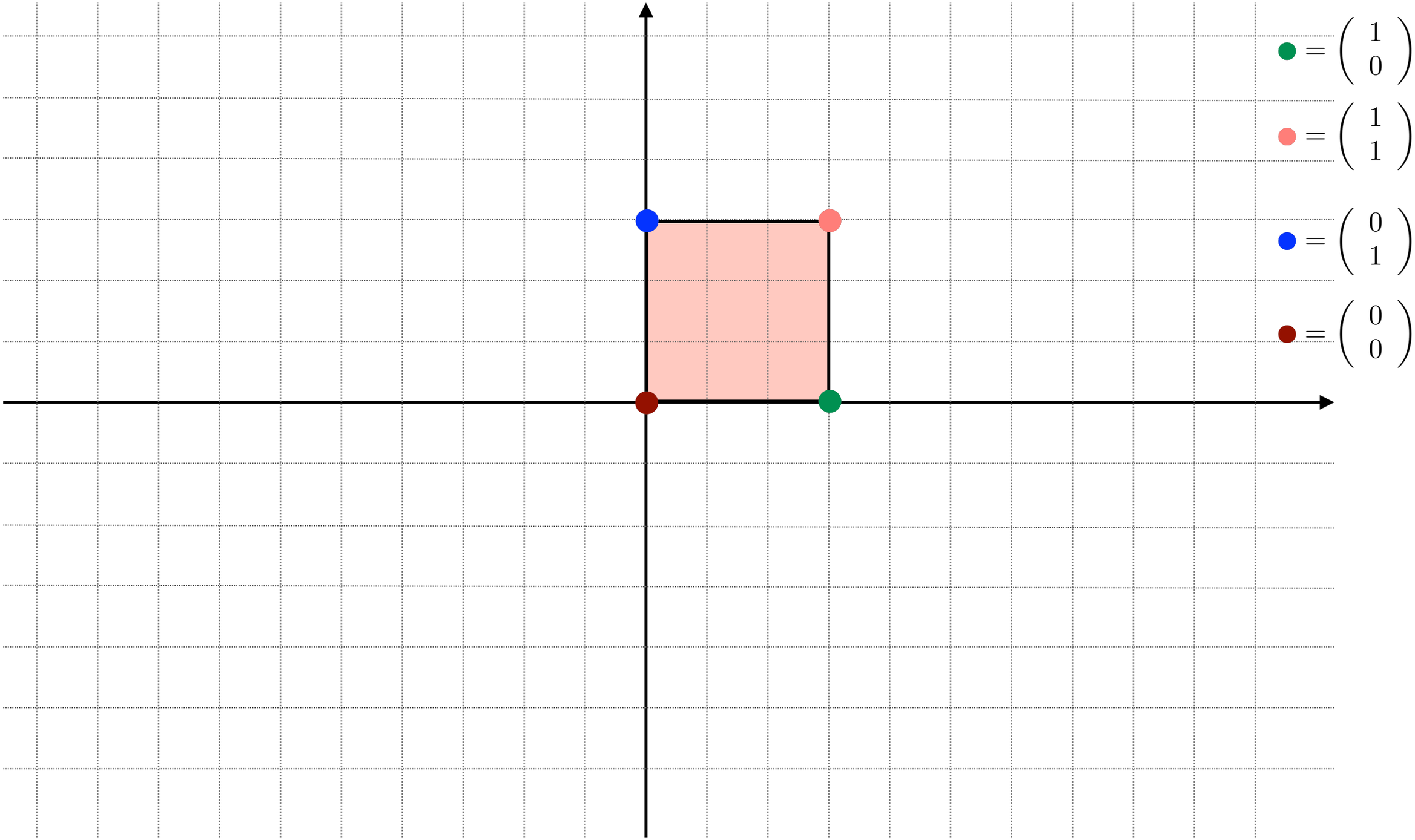


# Réflexion par (0,0)

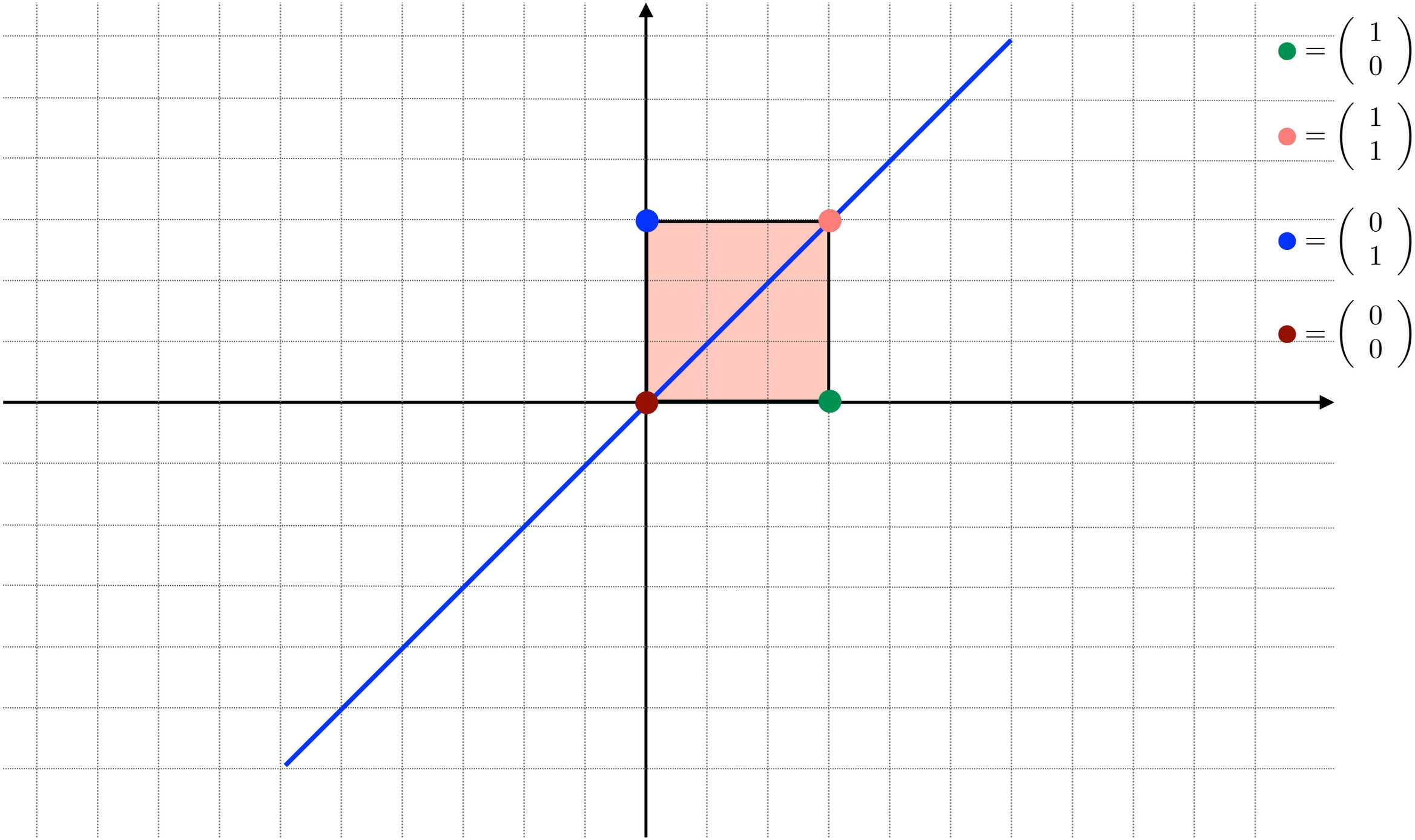
$$\begin{pmatrix} x \\ y \end{pmatrix} \mapsto \begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$$



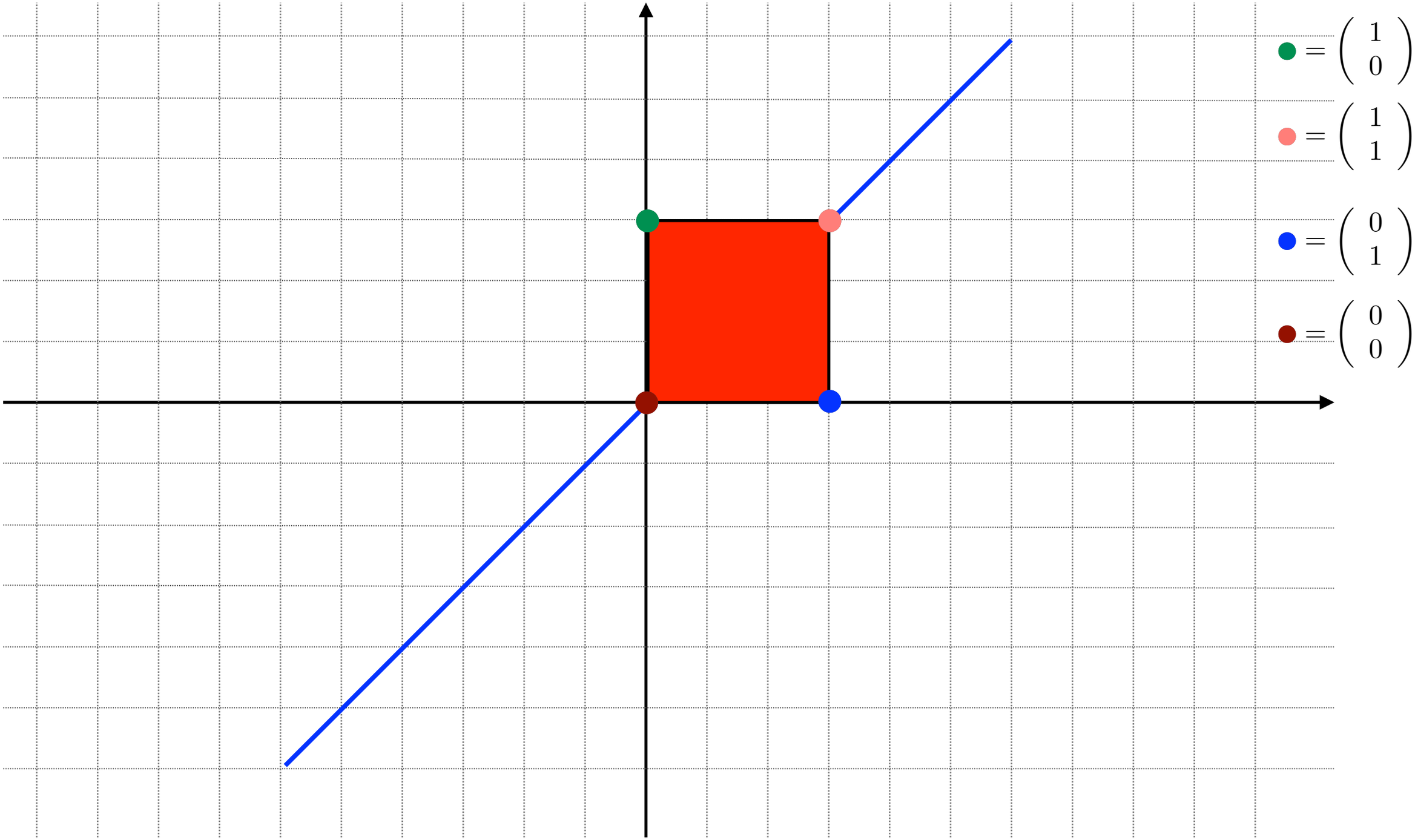
# Réflexion par rapport à la droite x=y



# Réflexion par rapport à la droite x=y

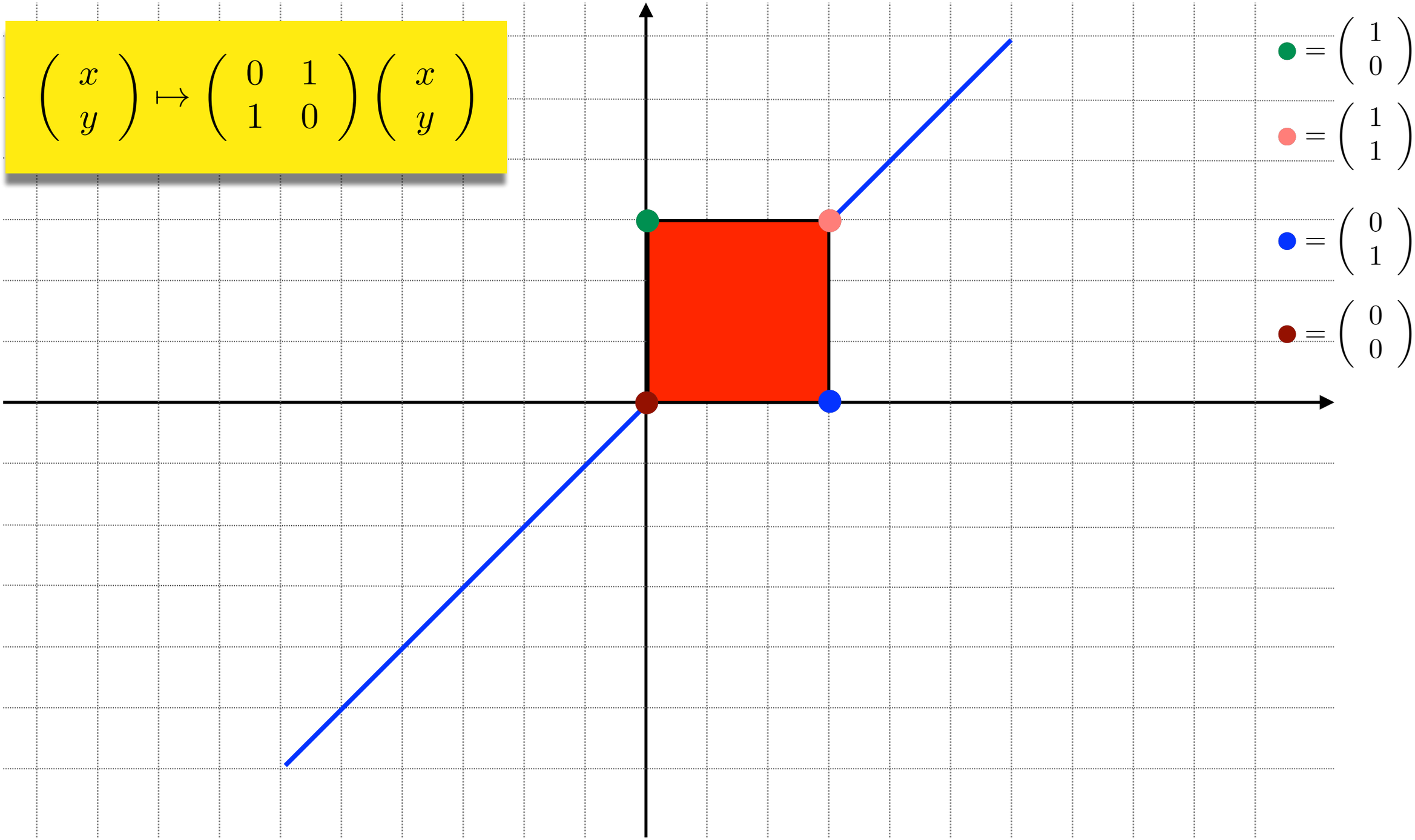


# Réflexion par rapport à la droite x=y

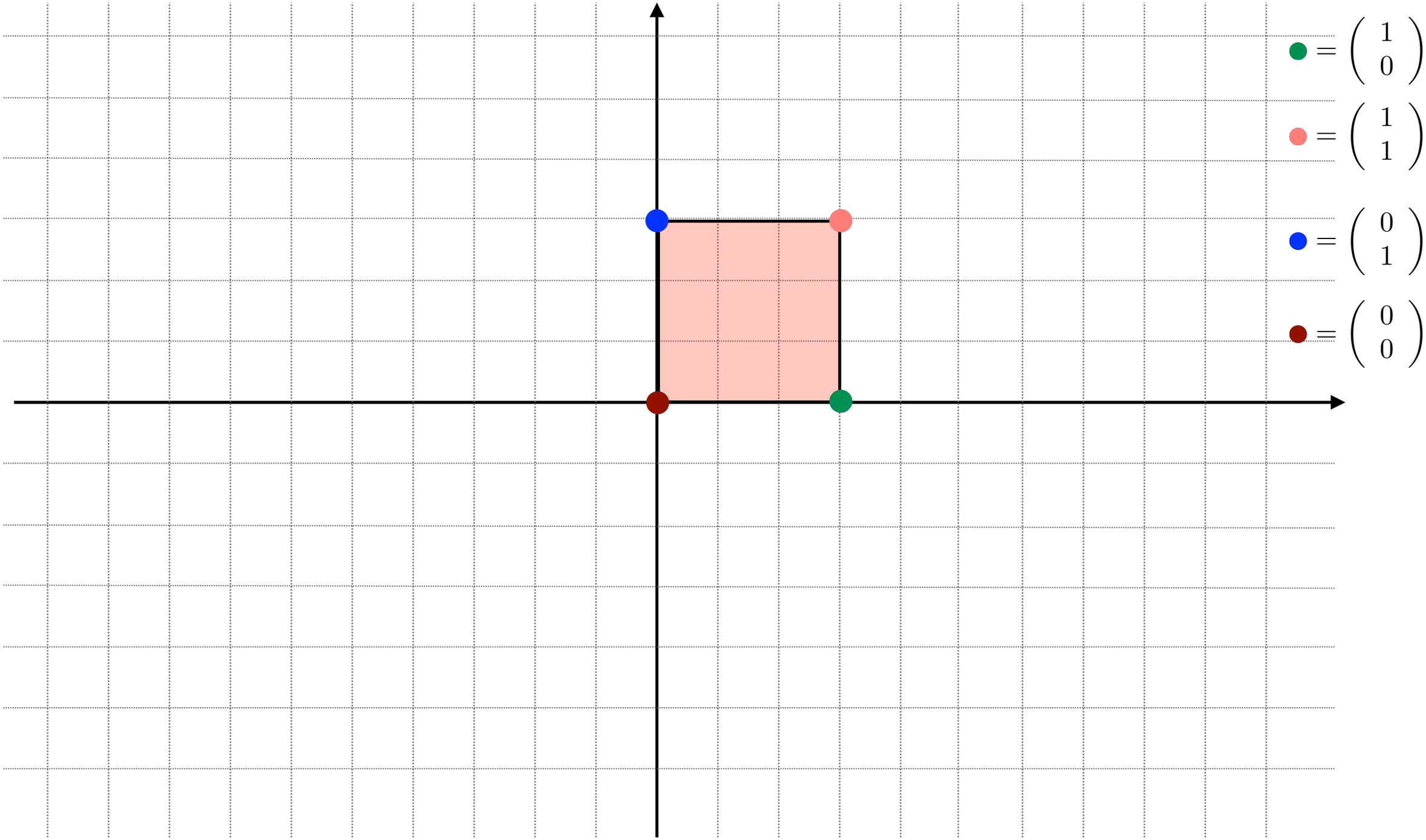


# Réflexion par rapport à la droite x=y

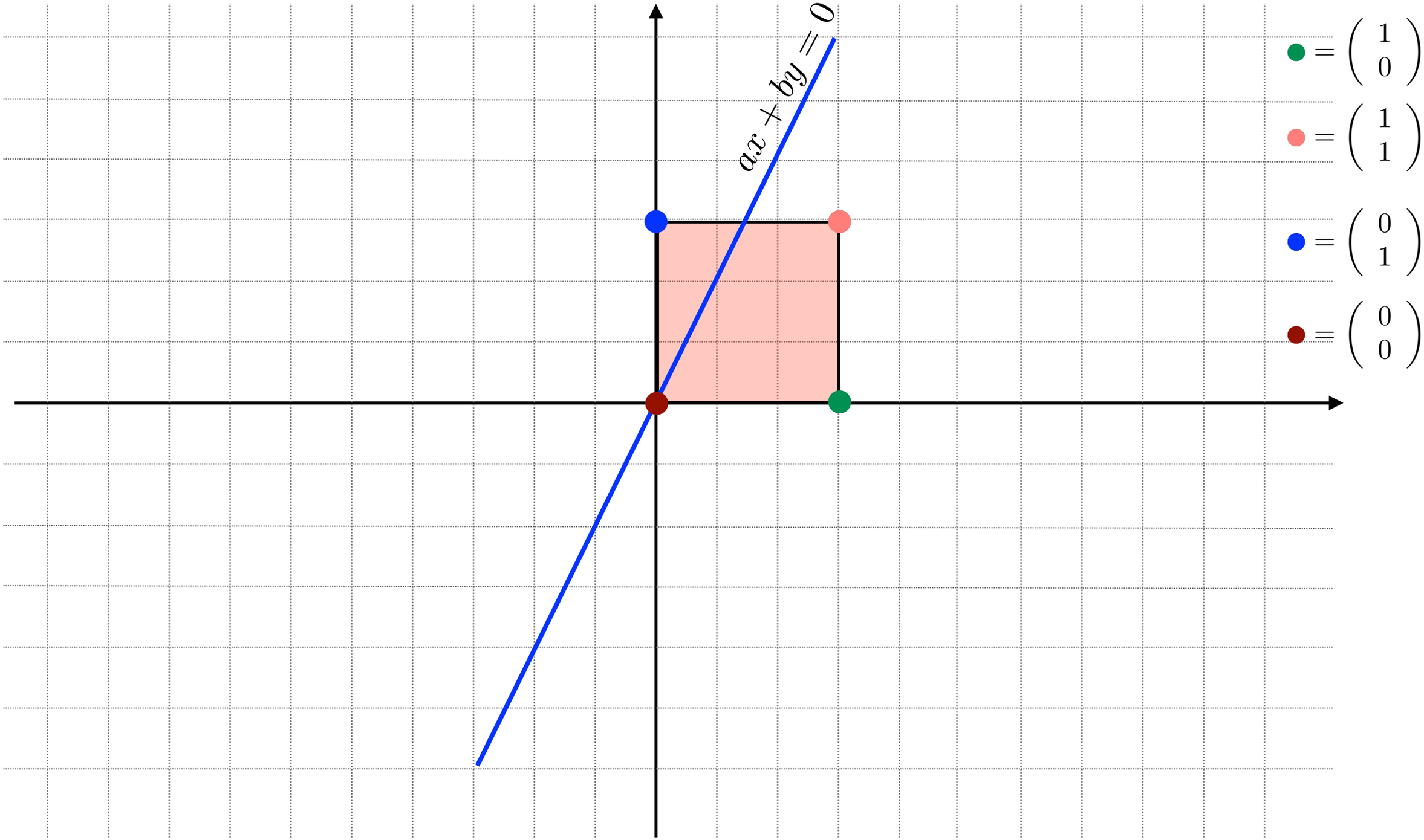
$$\begin{pmatrix} x \\ y \end{pmatrix} \mapsto \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$$



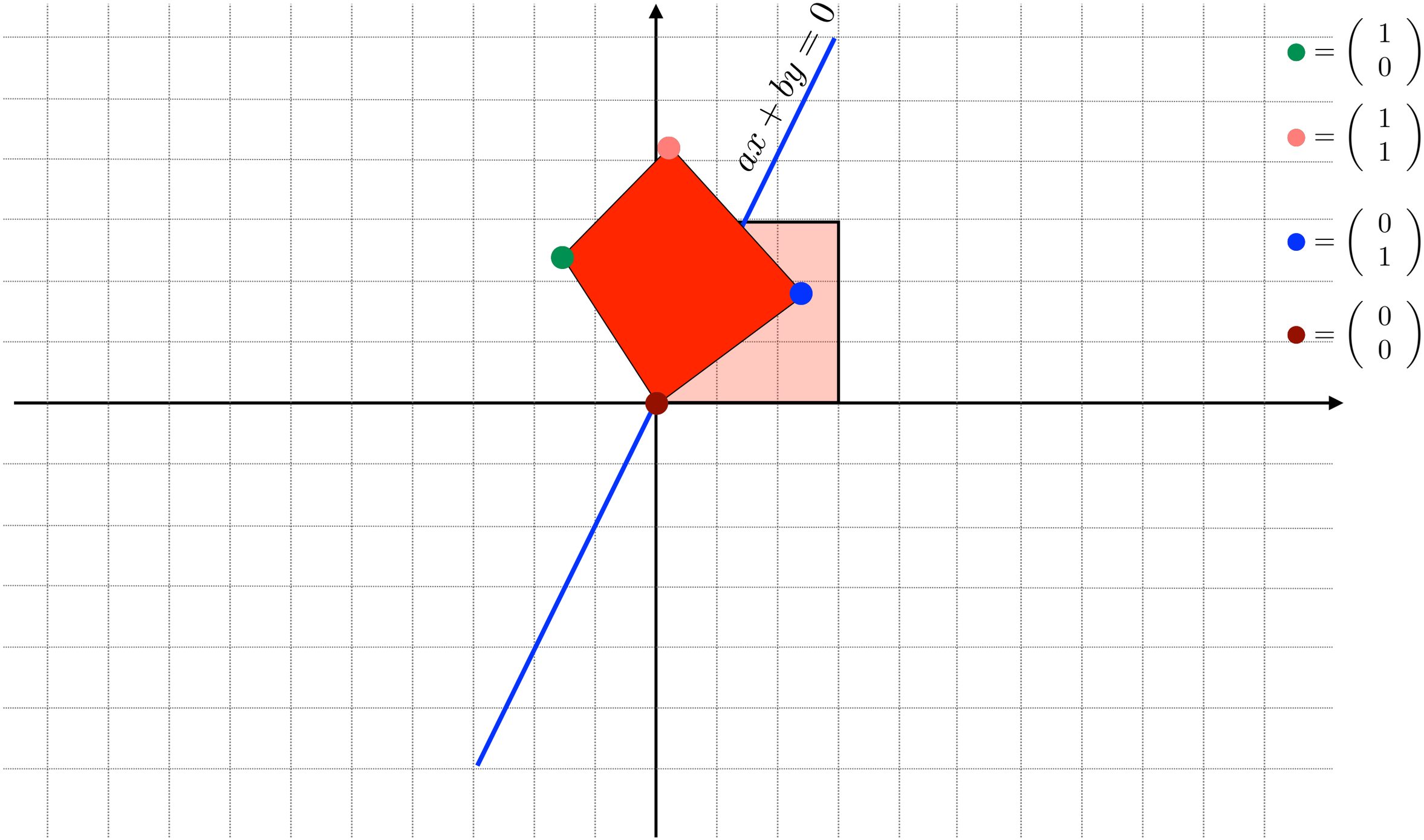
# Réflexion par rapport à une droite quelconque



# Réflexion par rapport à une droite quelconque

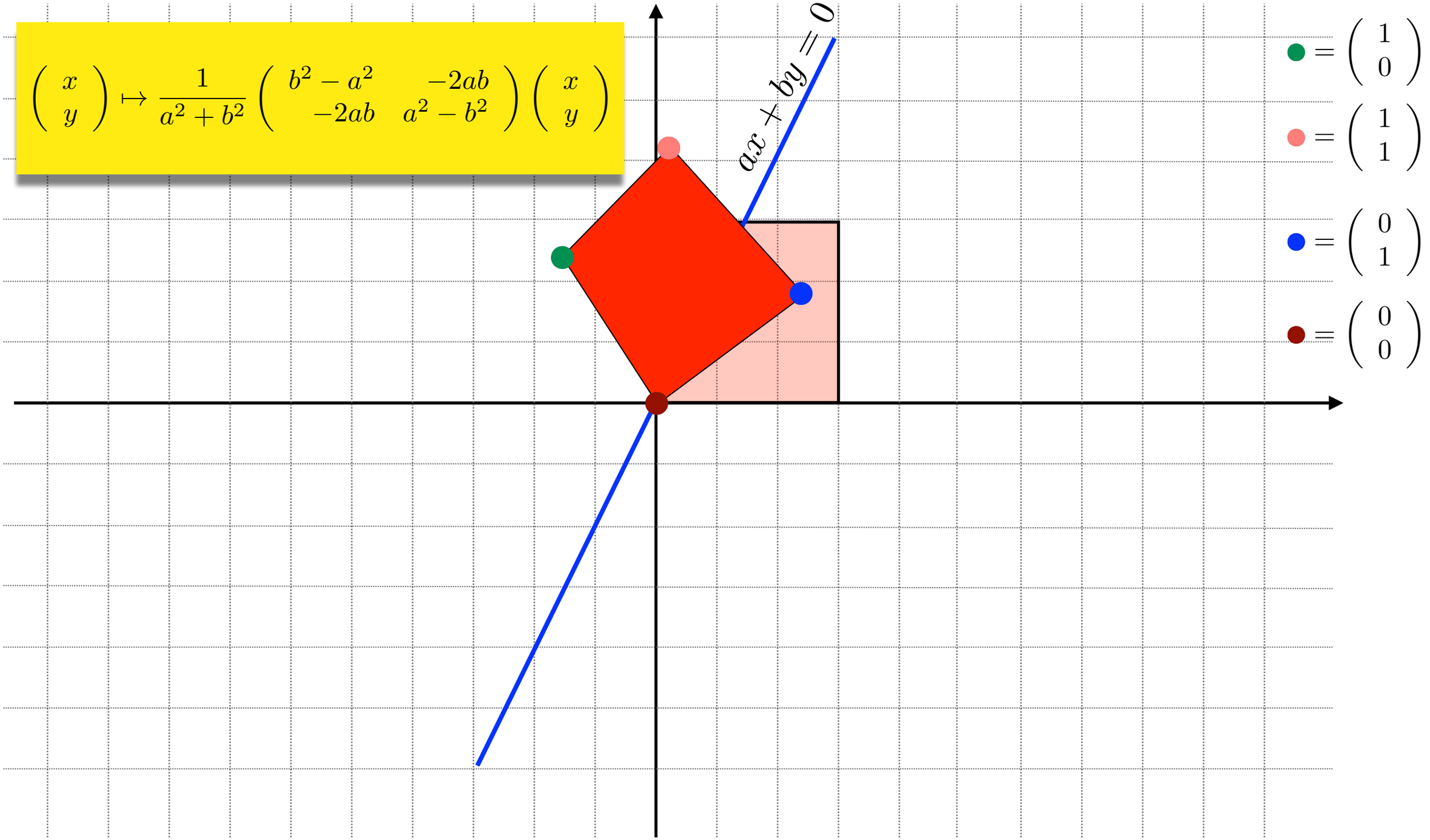


# Réflexion par rapport à une droite quelconque

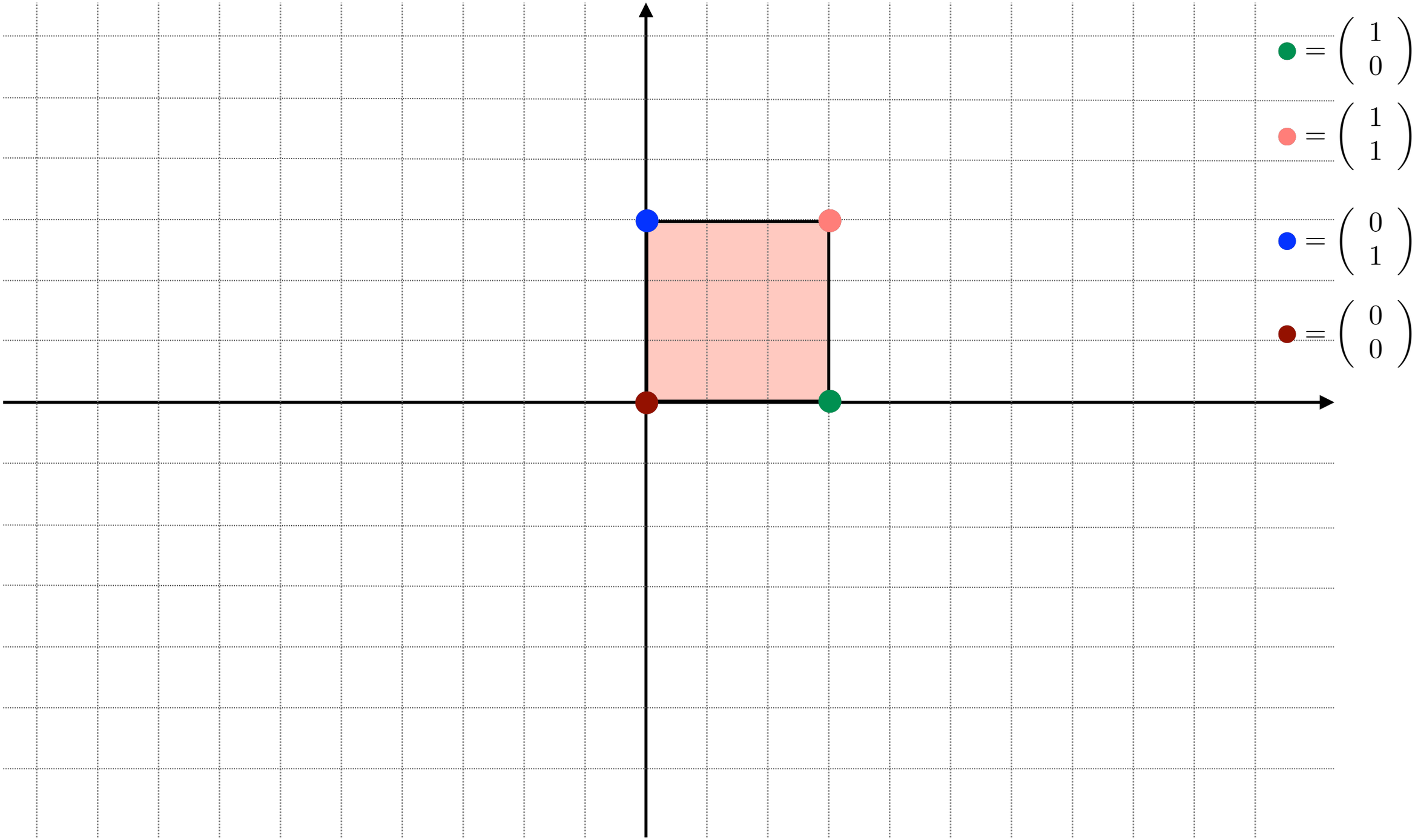


# Réflexion par rapport à une droite quelconque

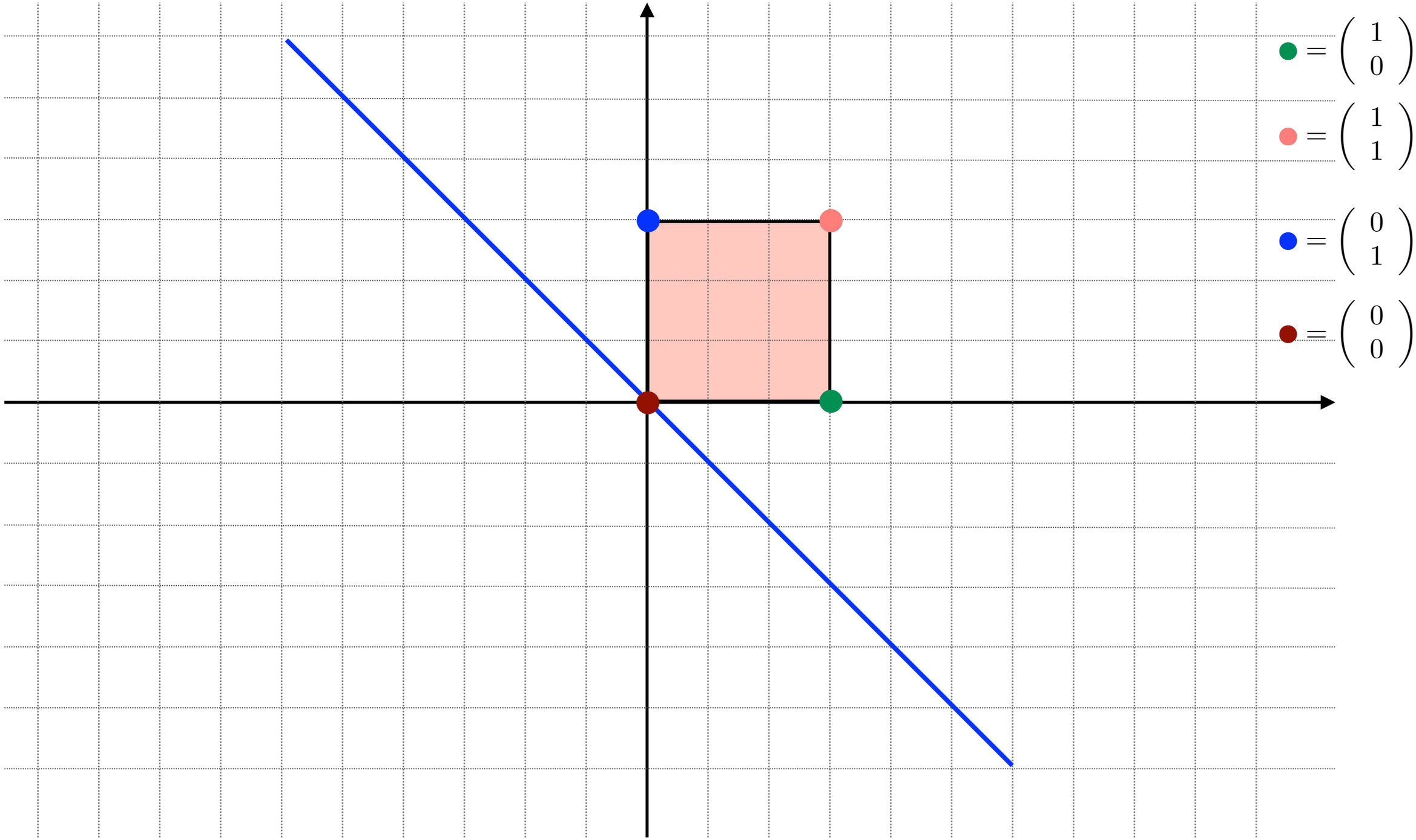
$$\begin{pmatrix} x \\ y \end{pmatrix} \mapsto \frac{1}{a^2+b^2} \begin{pmatrix} b^2-a^2 & -2ab \\ -2ab & a^2-b^2 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$$



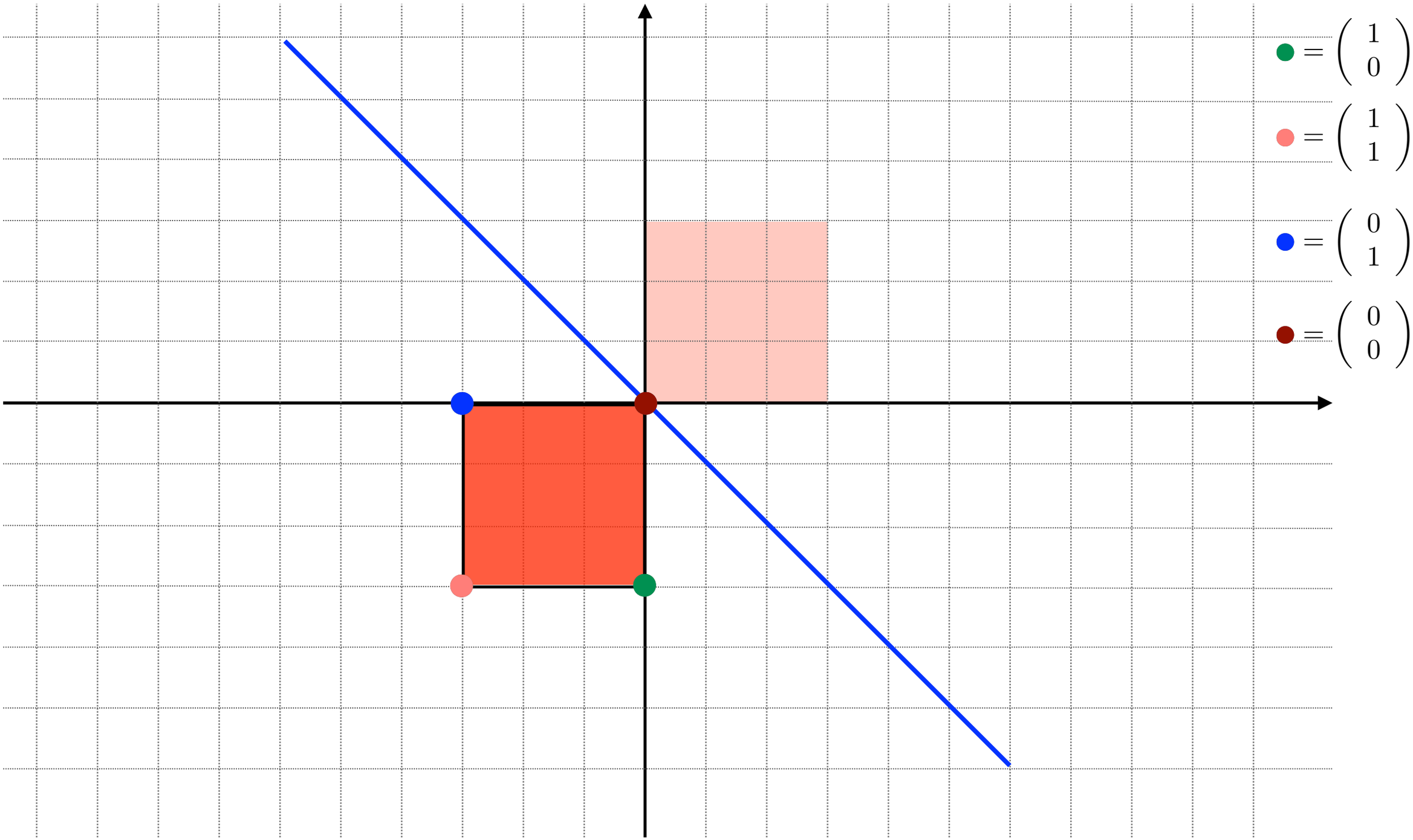
# Réflexion par rapport à la droite y=-x



# Réflexion par rapport à la droite y=-x

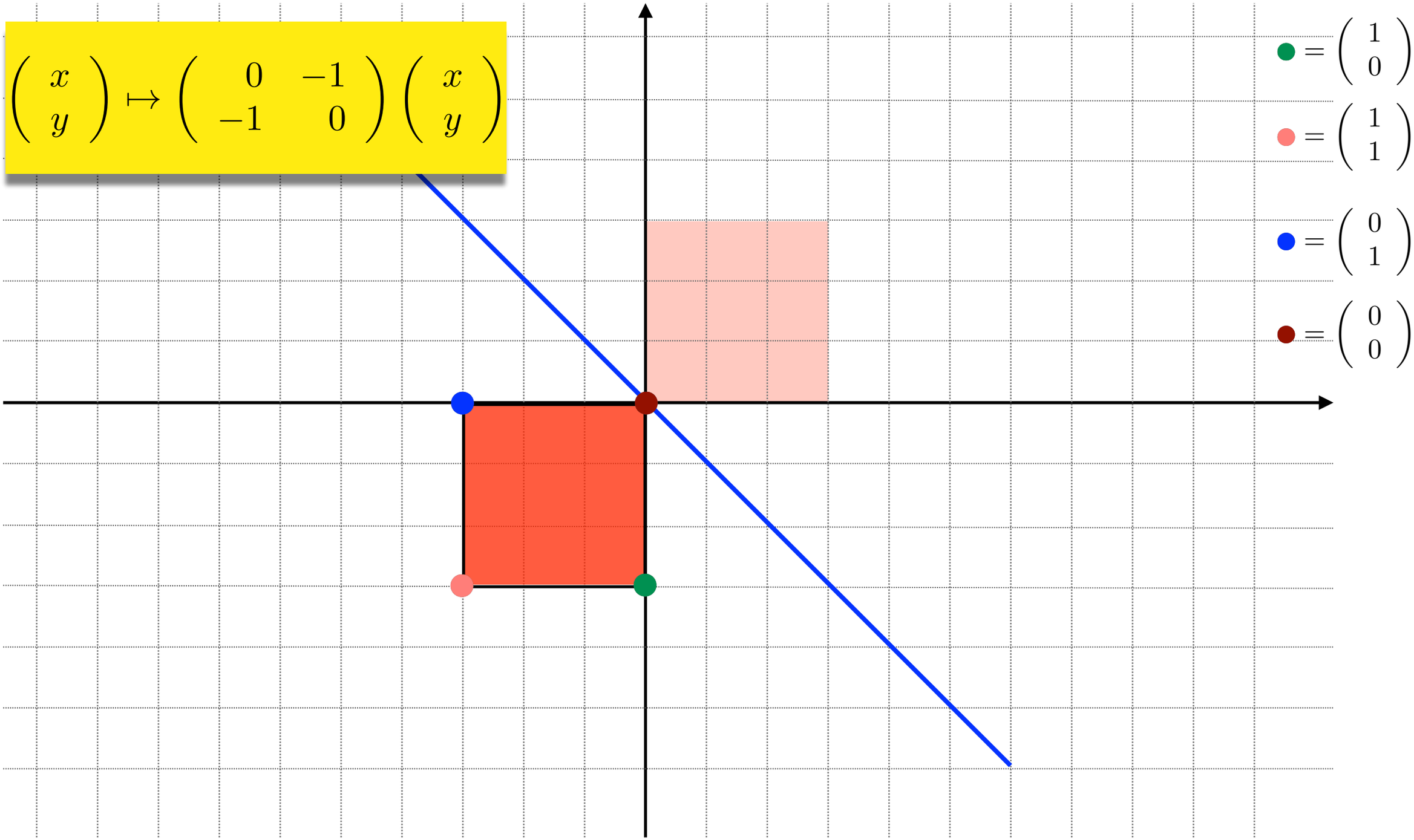


# Réflexion par rapport à la droite y=-x

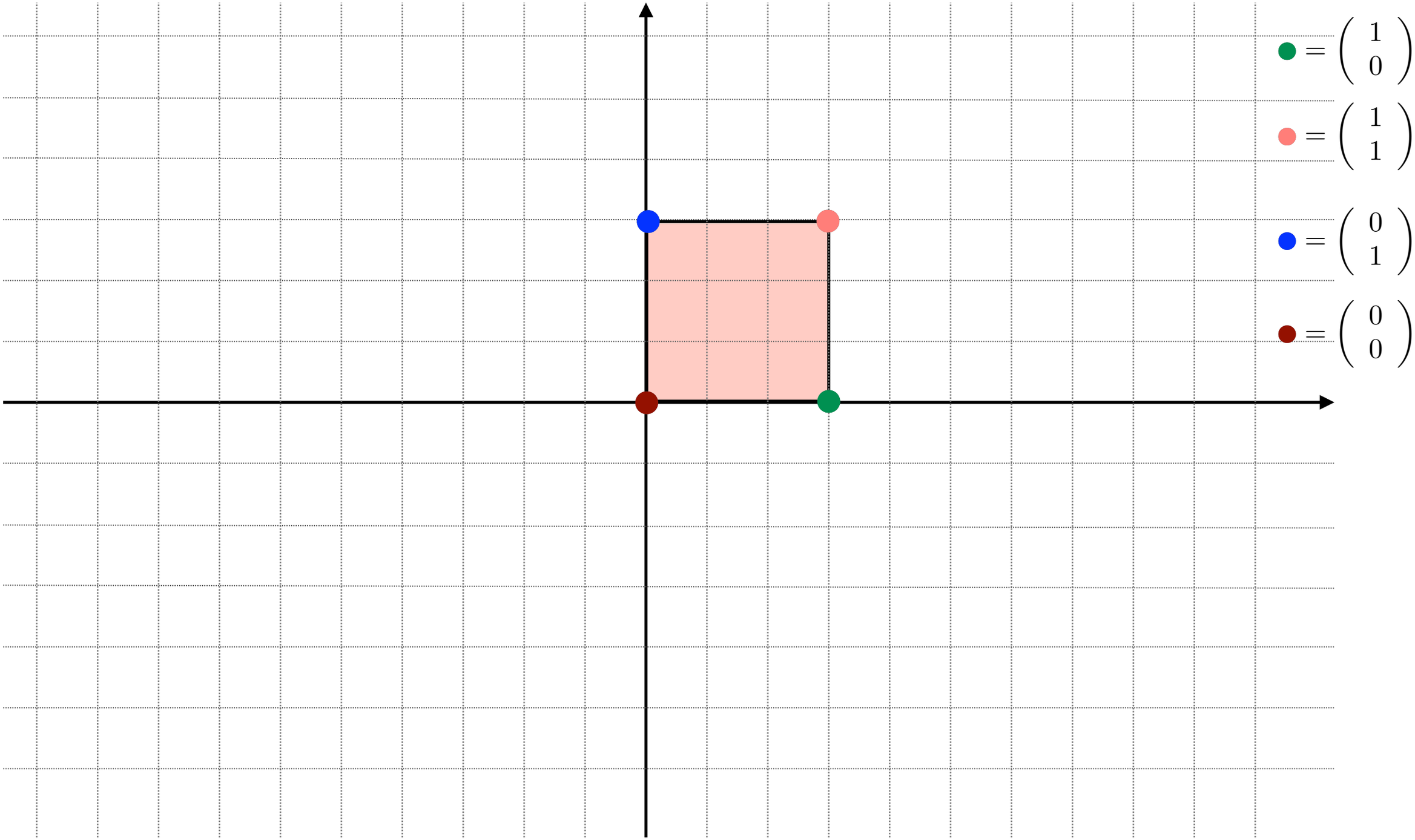


# Réflexion par rapport à la droite y=-x

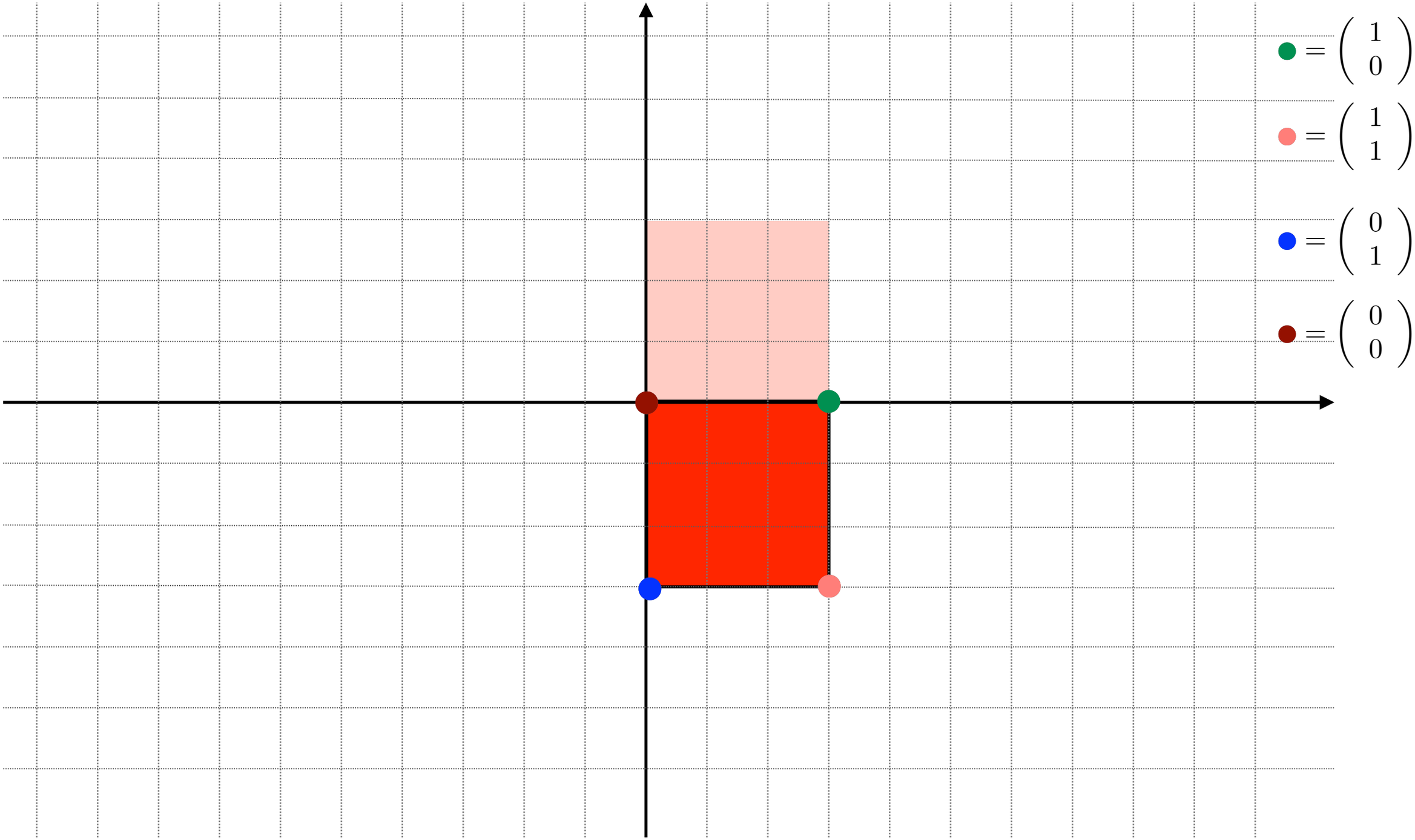
$$\begin{pmatrix} x \\ y \end{pmatrix} \mapsto \begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$$



# Réflexion par rapport à l'axe horizontal

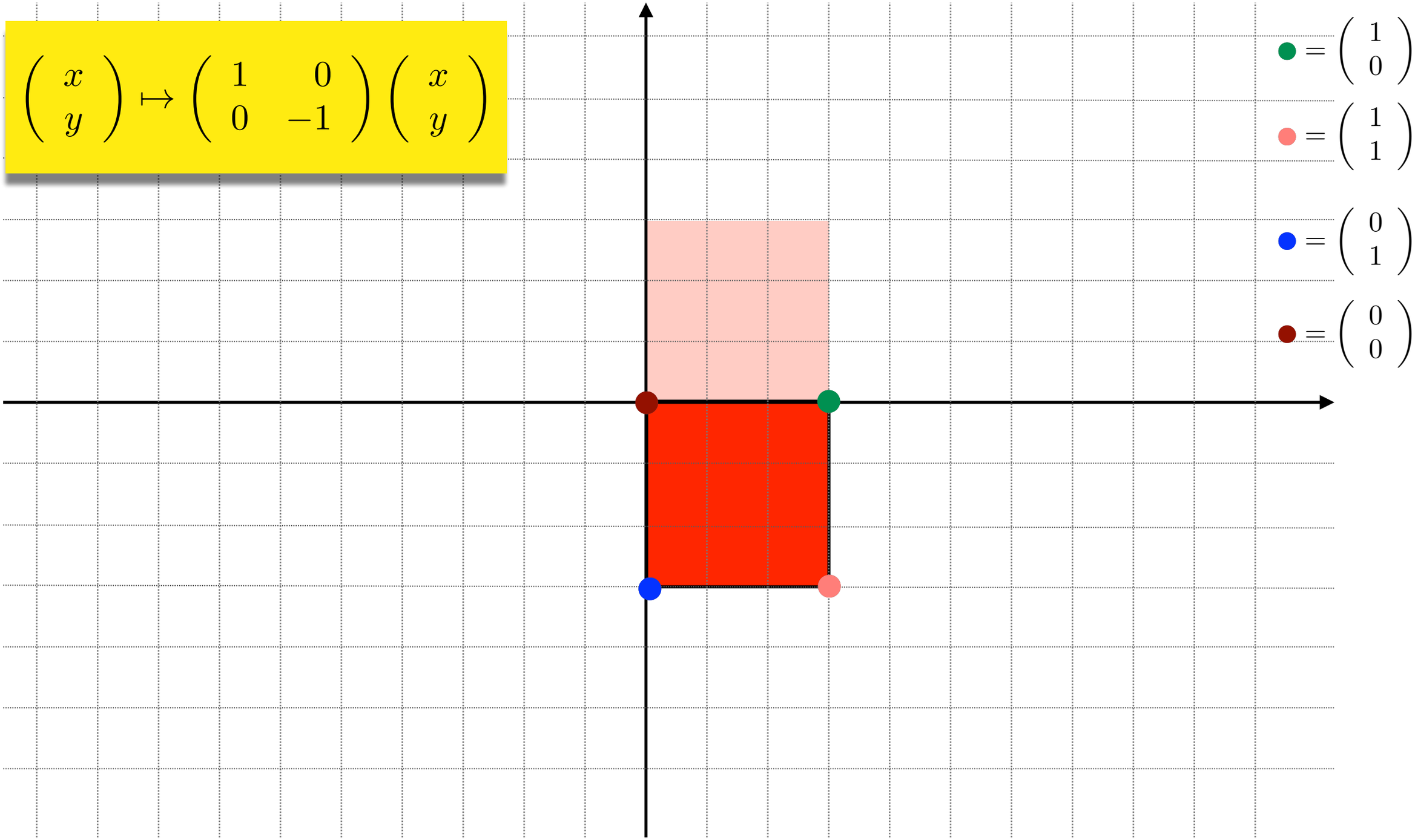


# Réflexion par rapport à l'axe horizontal

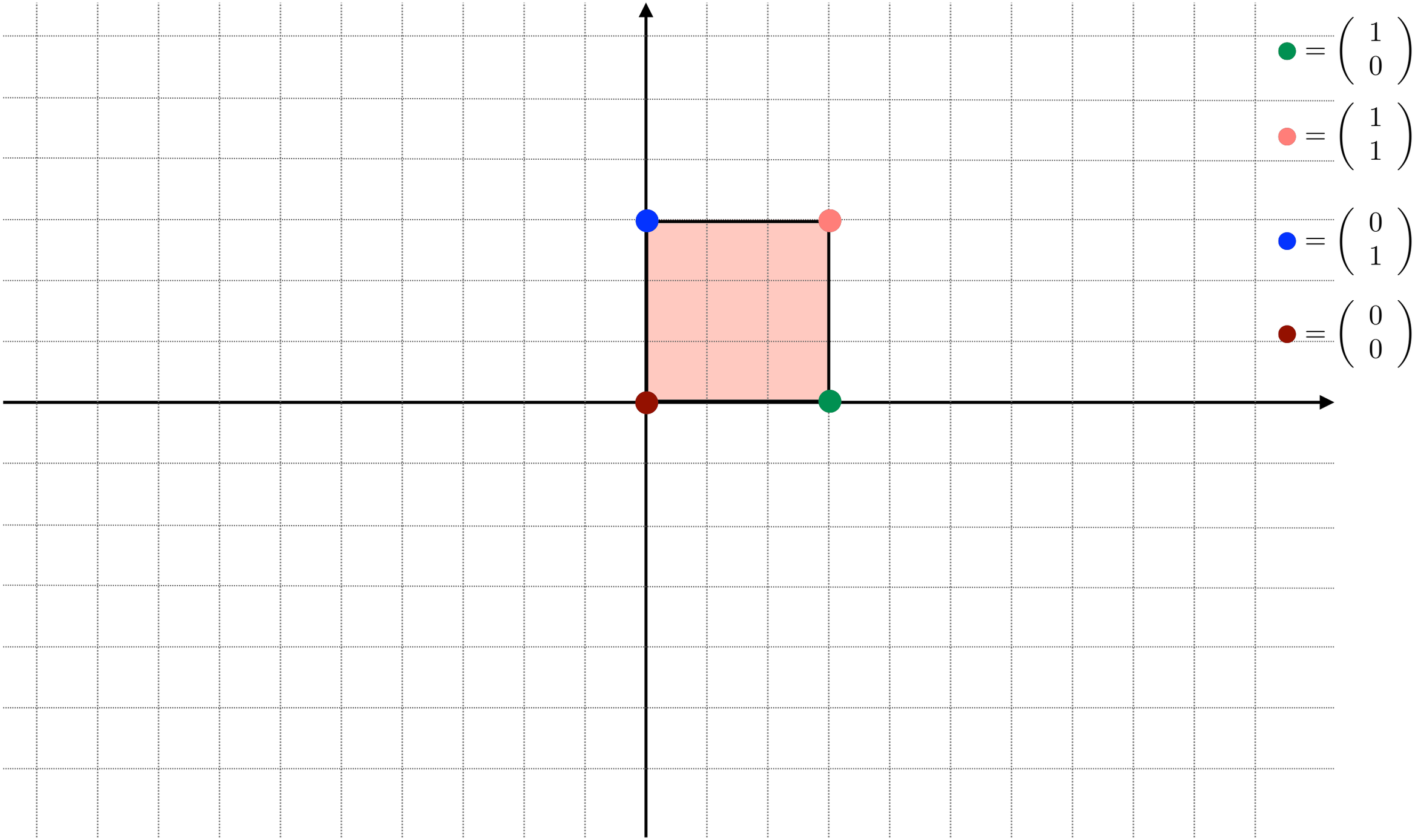


# Réflexion par rapport à l'axe horizontal

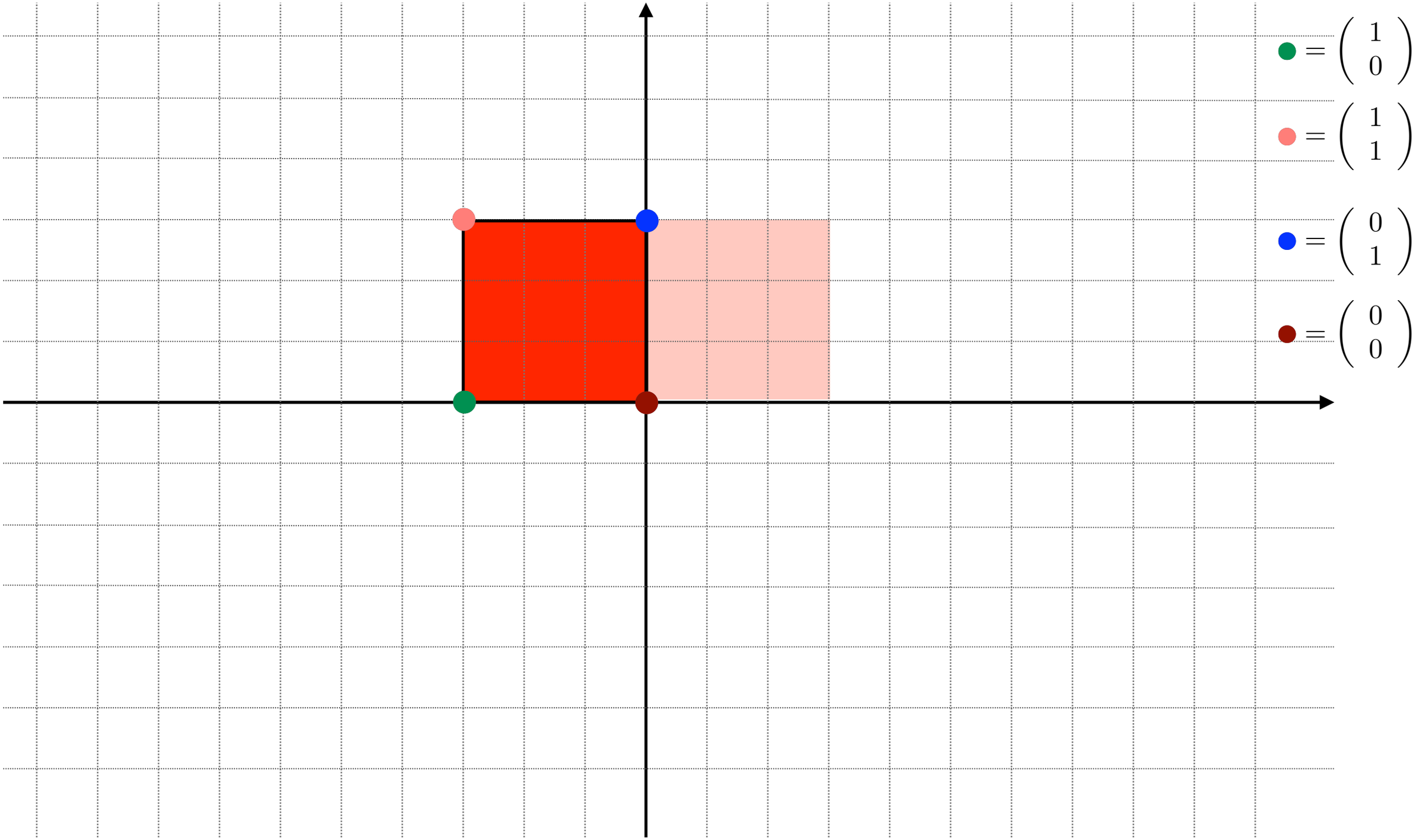
$$\begin{pmatrix} x \\ y \end{pmatrix} \mapsto \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$$



# Réflexion par rapport à l'axe vertical

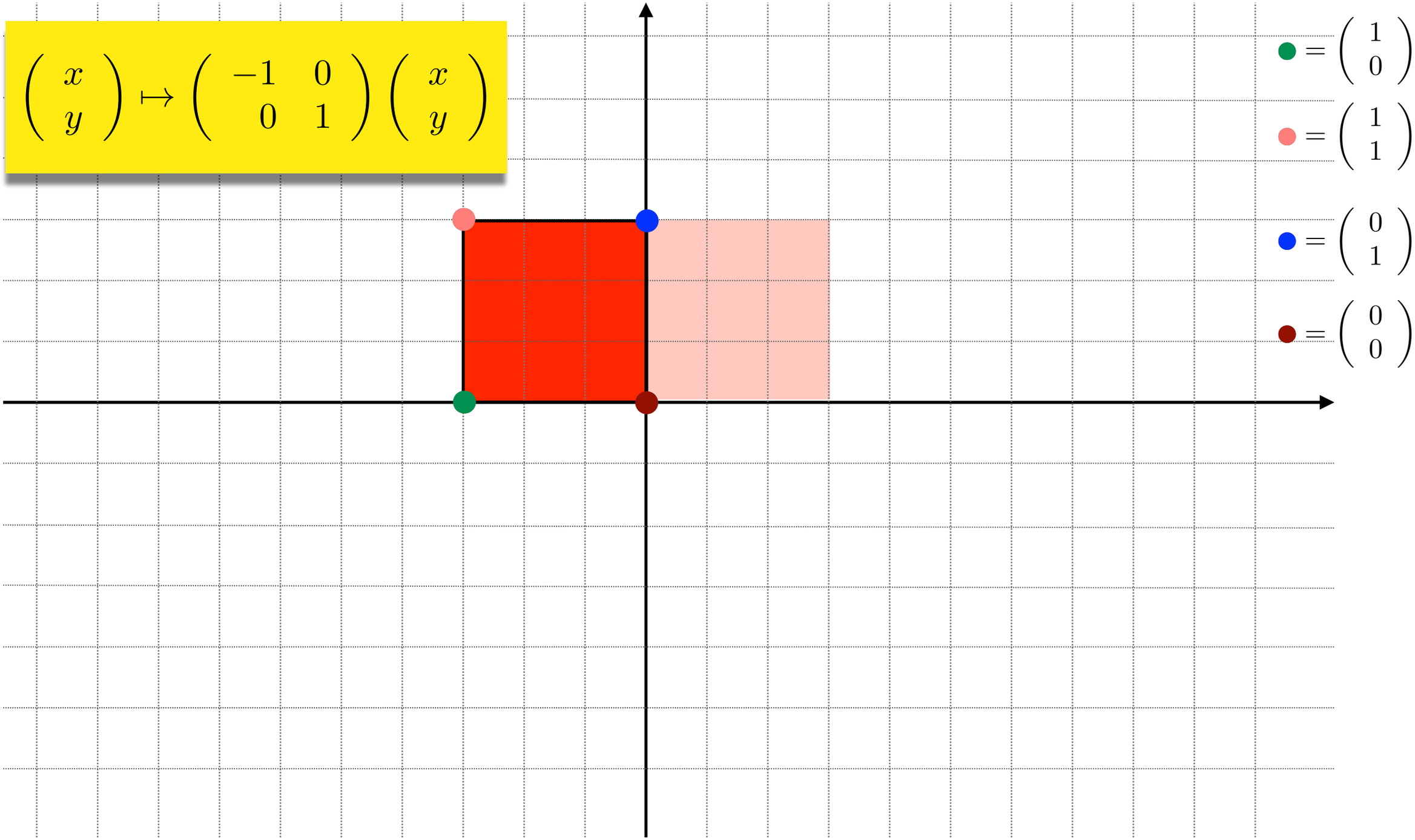


# Réflexion par rapport à l'axe vertical

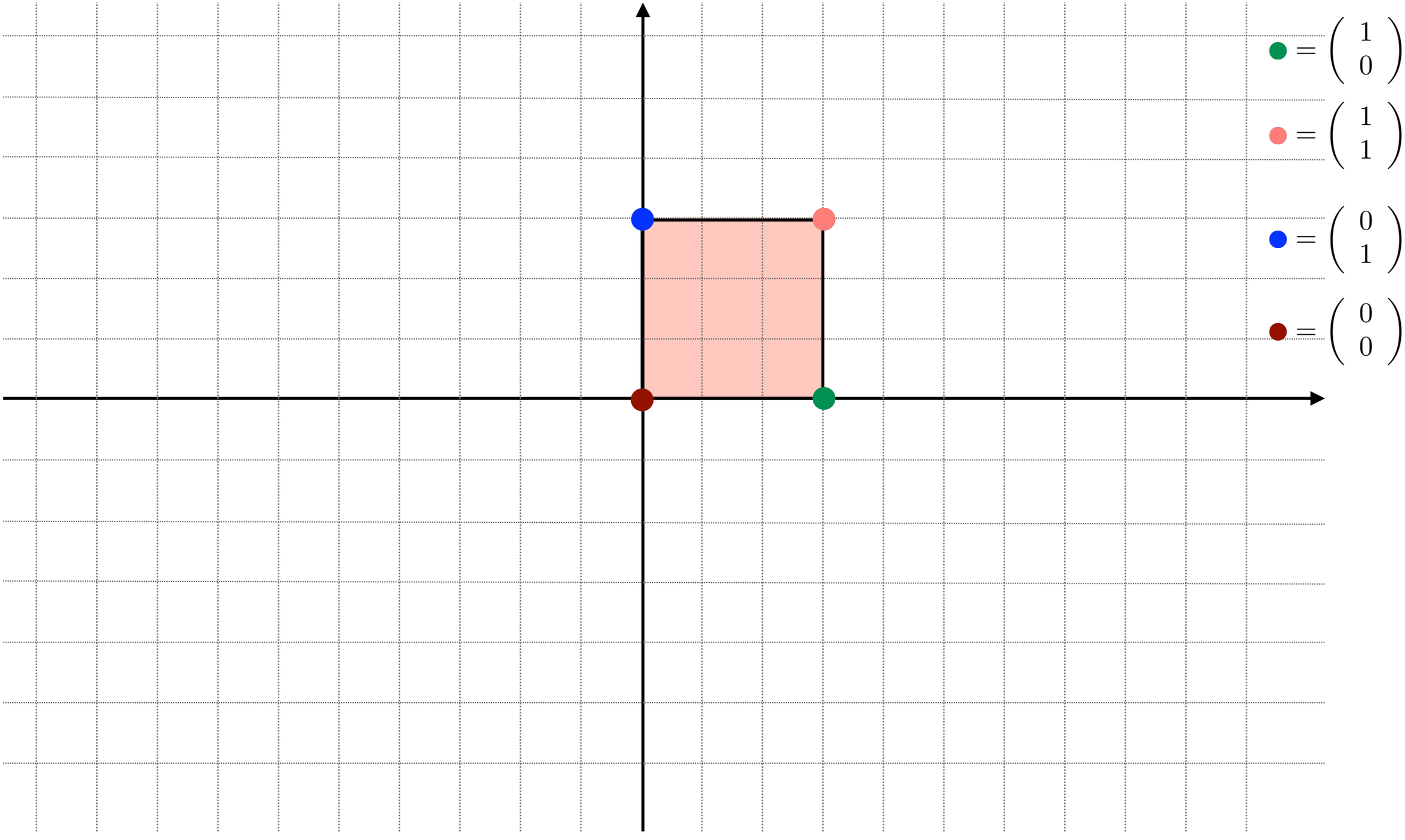


# Réflexion par rapport à l'axe vertical

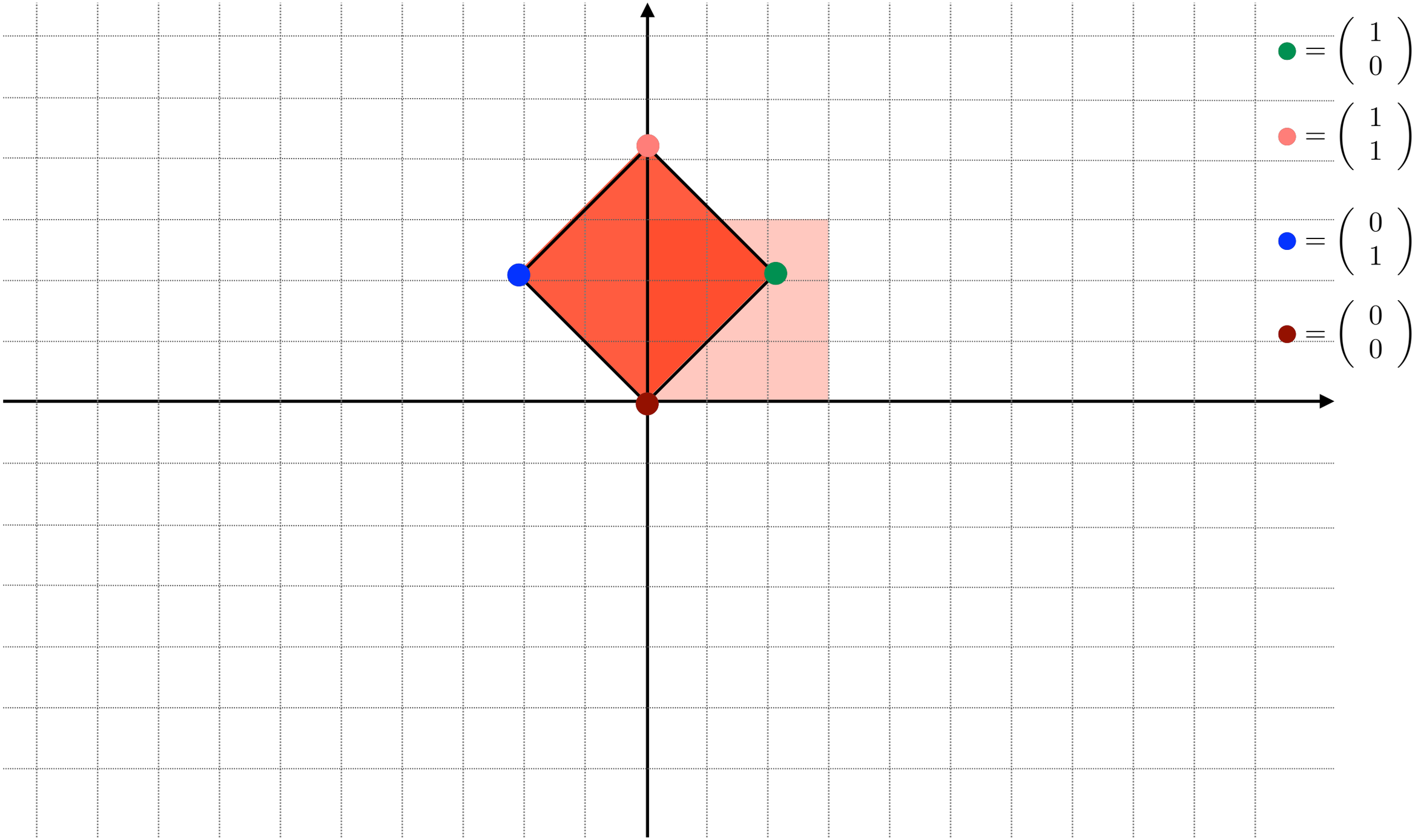
$$\begin{pmatrix} x \\ y \end{pmatrix} \mapsto \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$$



# Rotation d’angle 45 degrés

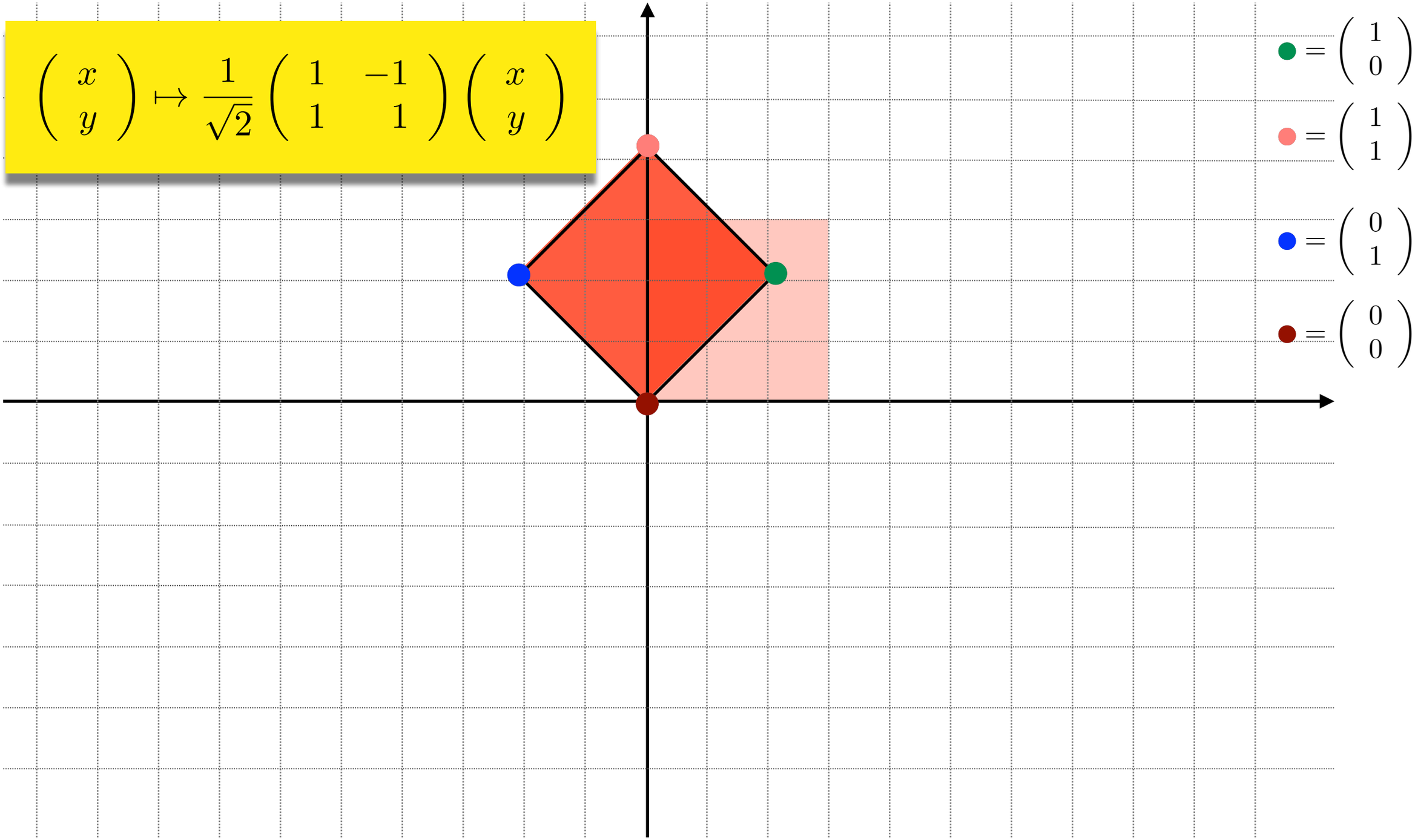


# Rotation d’angle 45 degrés

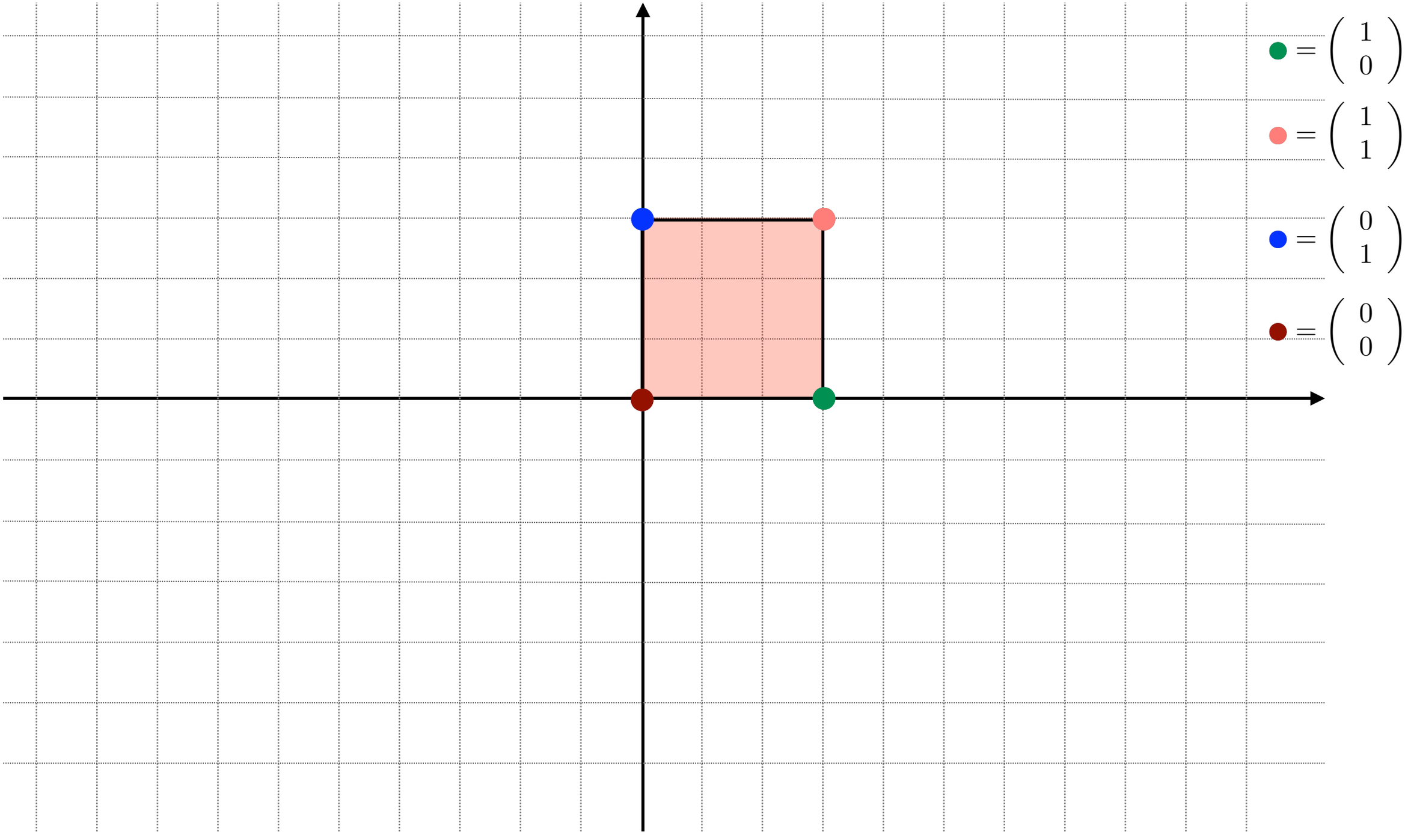


# Rotation d'angle 45 degrés

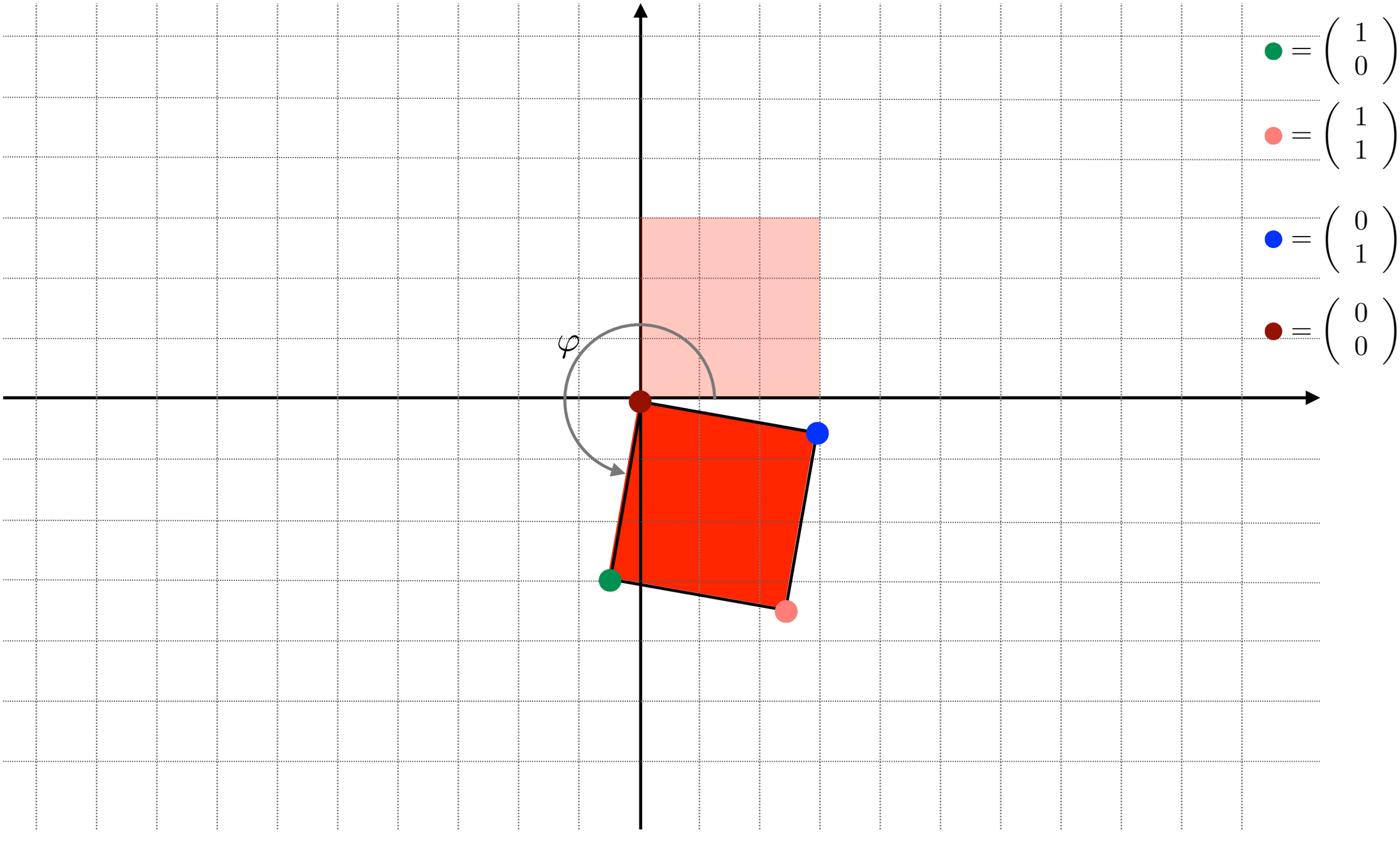
$$\begin{pmatrix} x \\ y \end{pmatrix} \mapsto \frac{1}{\sqrt{2}} \begin{pmatrix} 1 & -1 \\ 1 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$$



# Rotation d’angle quelconque

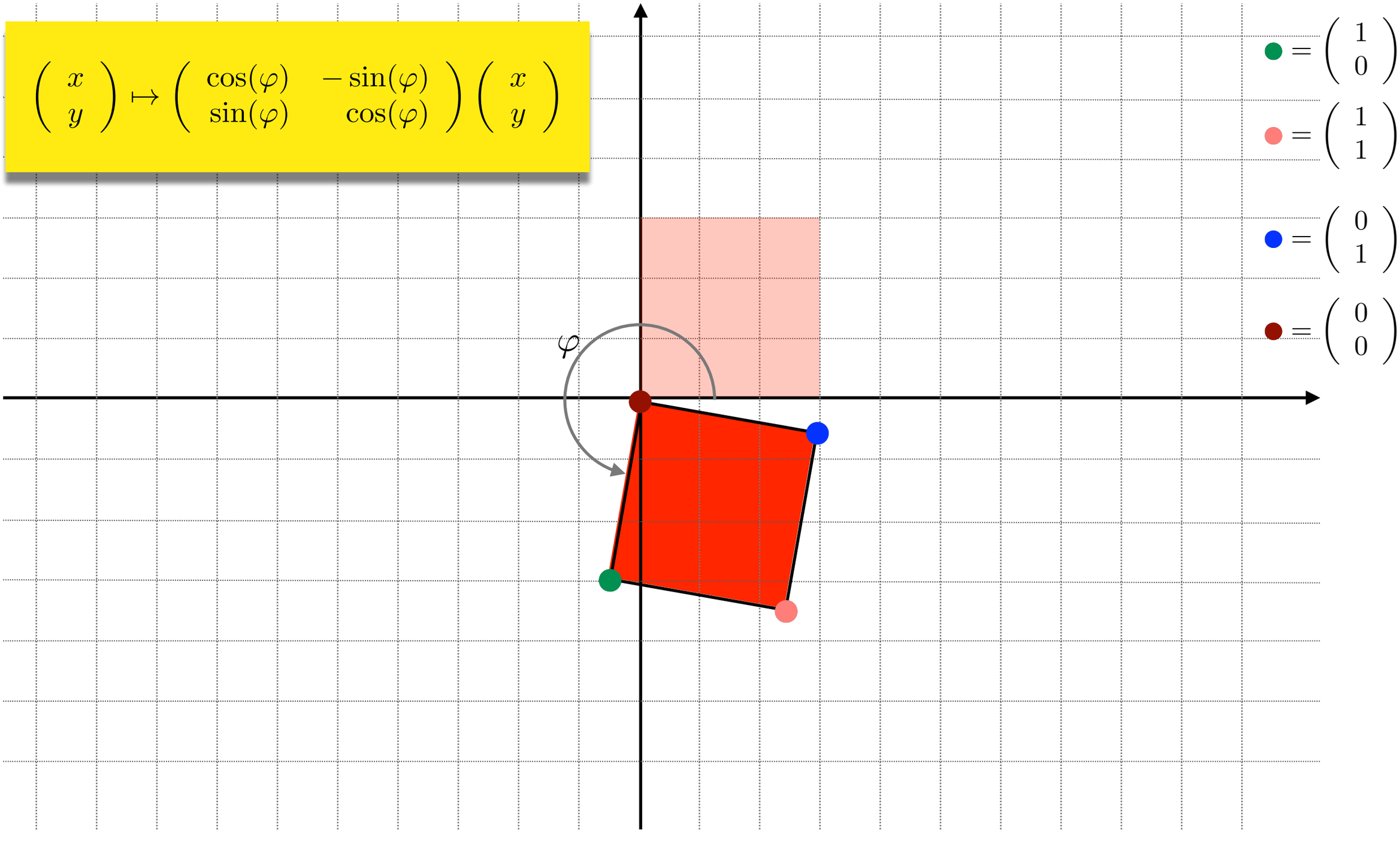


# Rotation d'angle quelconque

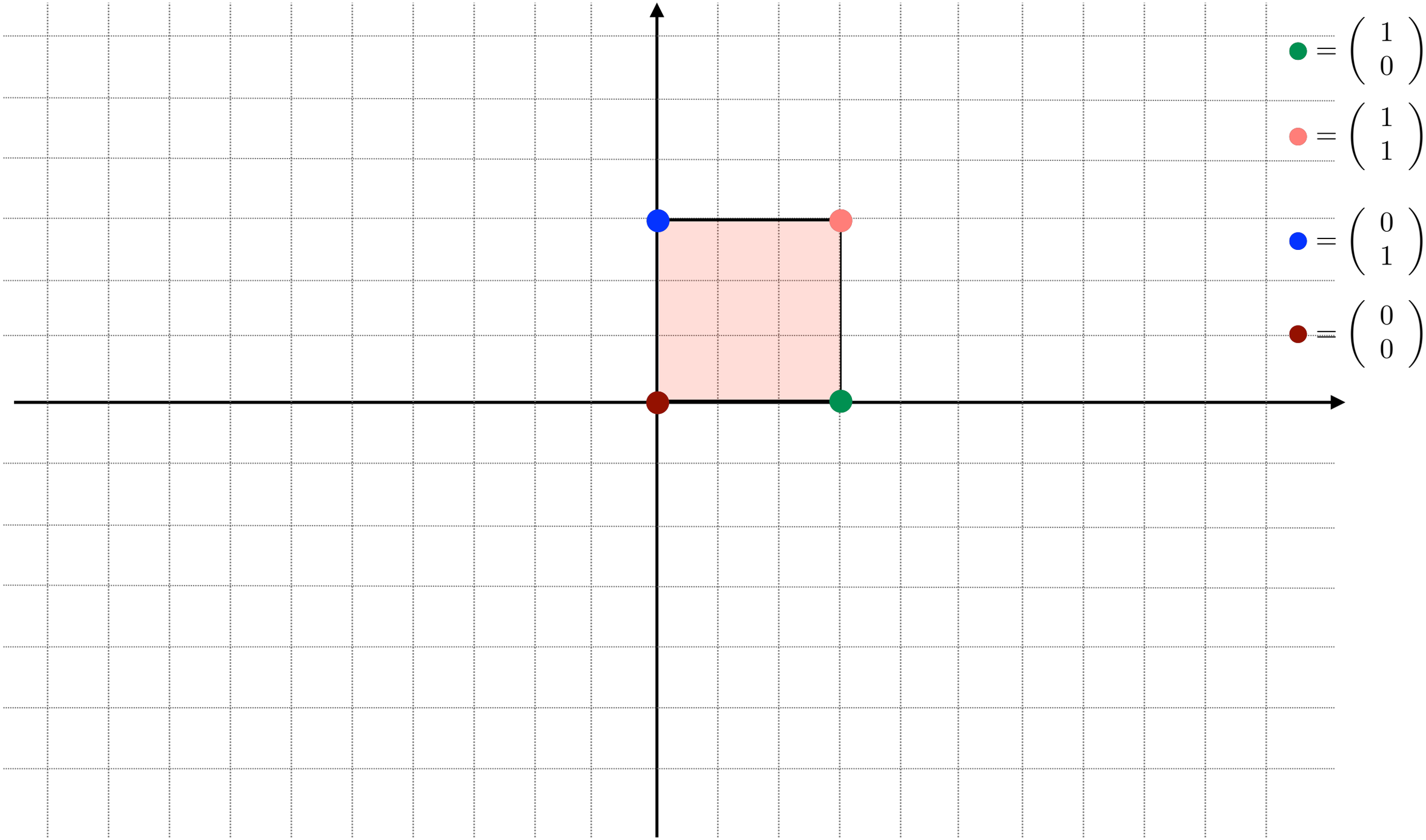


# Rotation d'angle quelconque

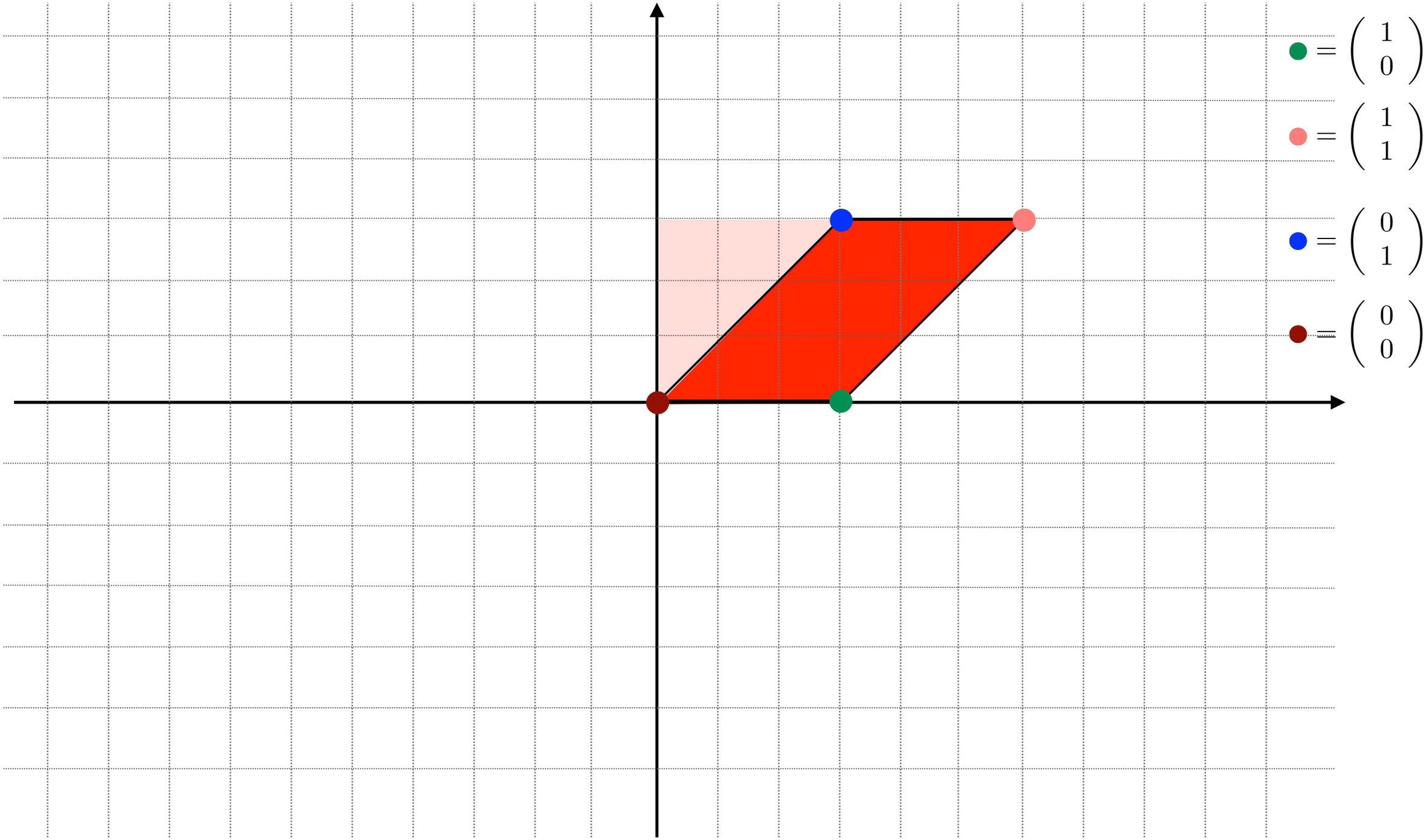
$$\begin{pmatrix} x \\ y \end{pmatrix} \mapsto \begin{pmatrix} \cos(\varphi) & -\sin(\varphi) \\ \sin(\varphi) & \cos(\varphi) \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$$



# Transvection horizontale

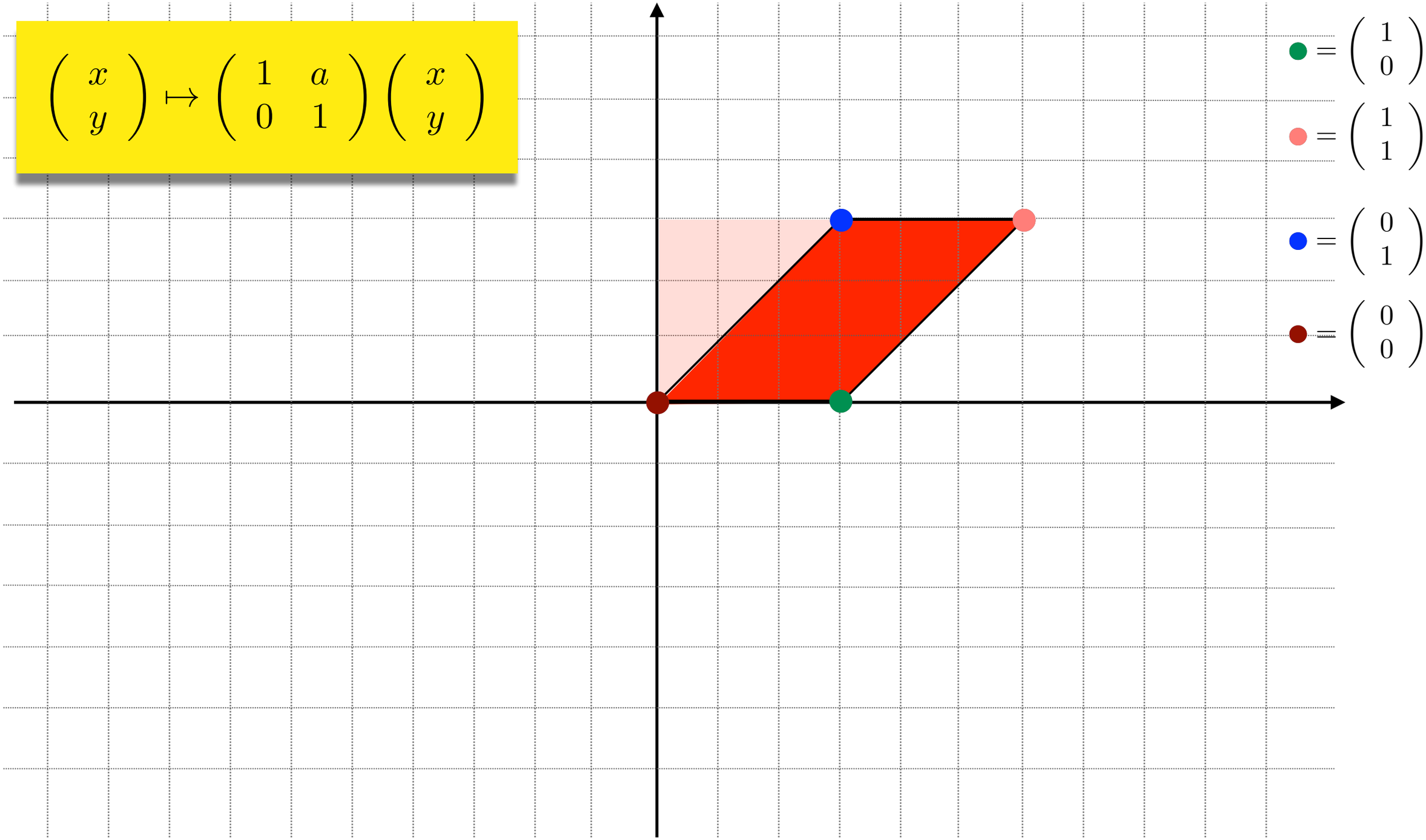


# Transvection horizontale

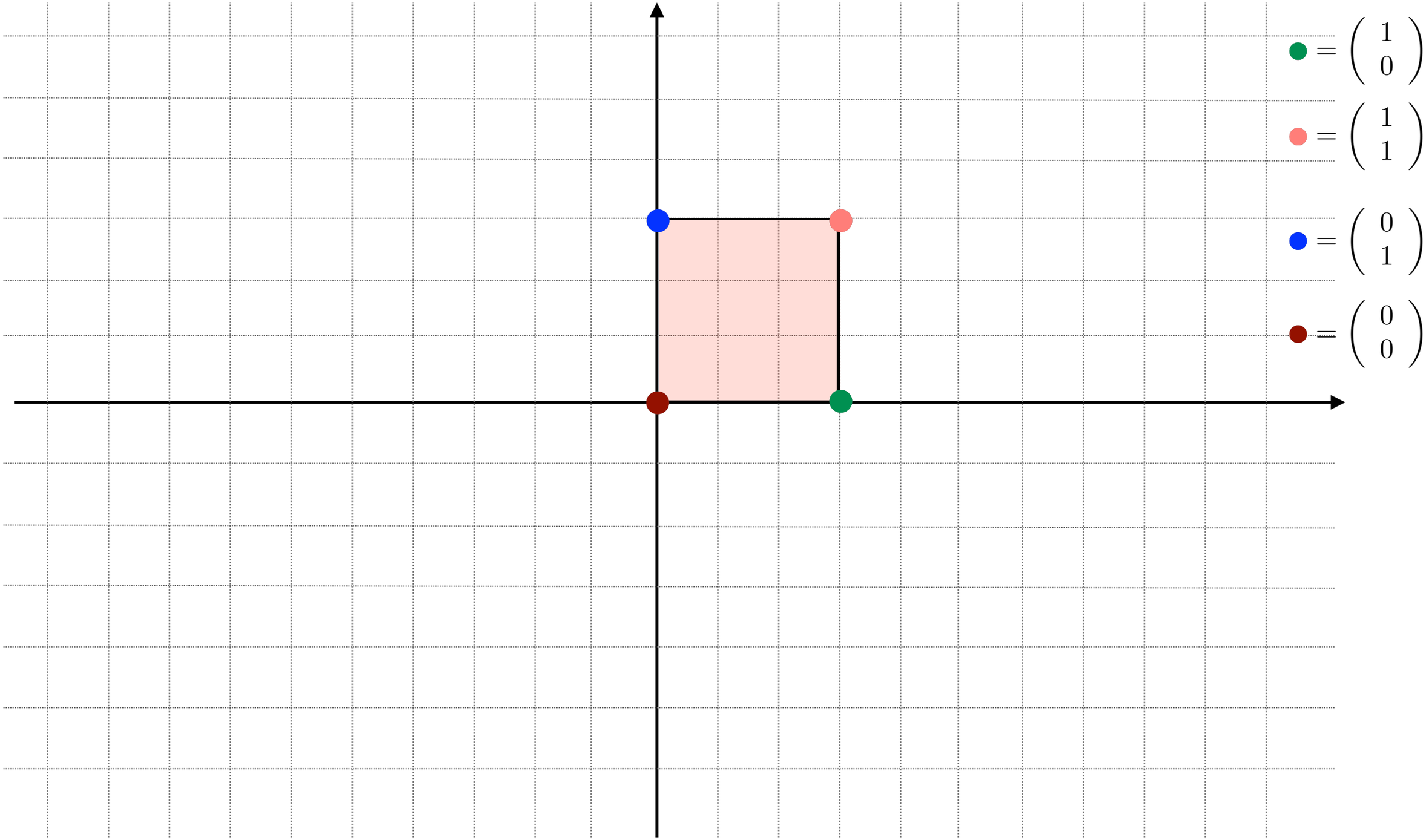


# Transvection horizontale

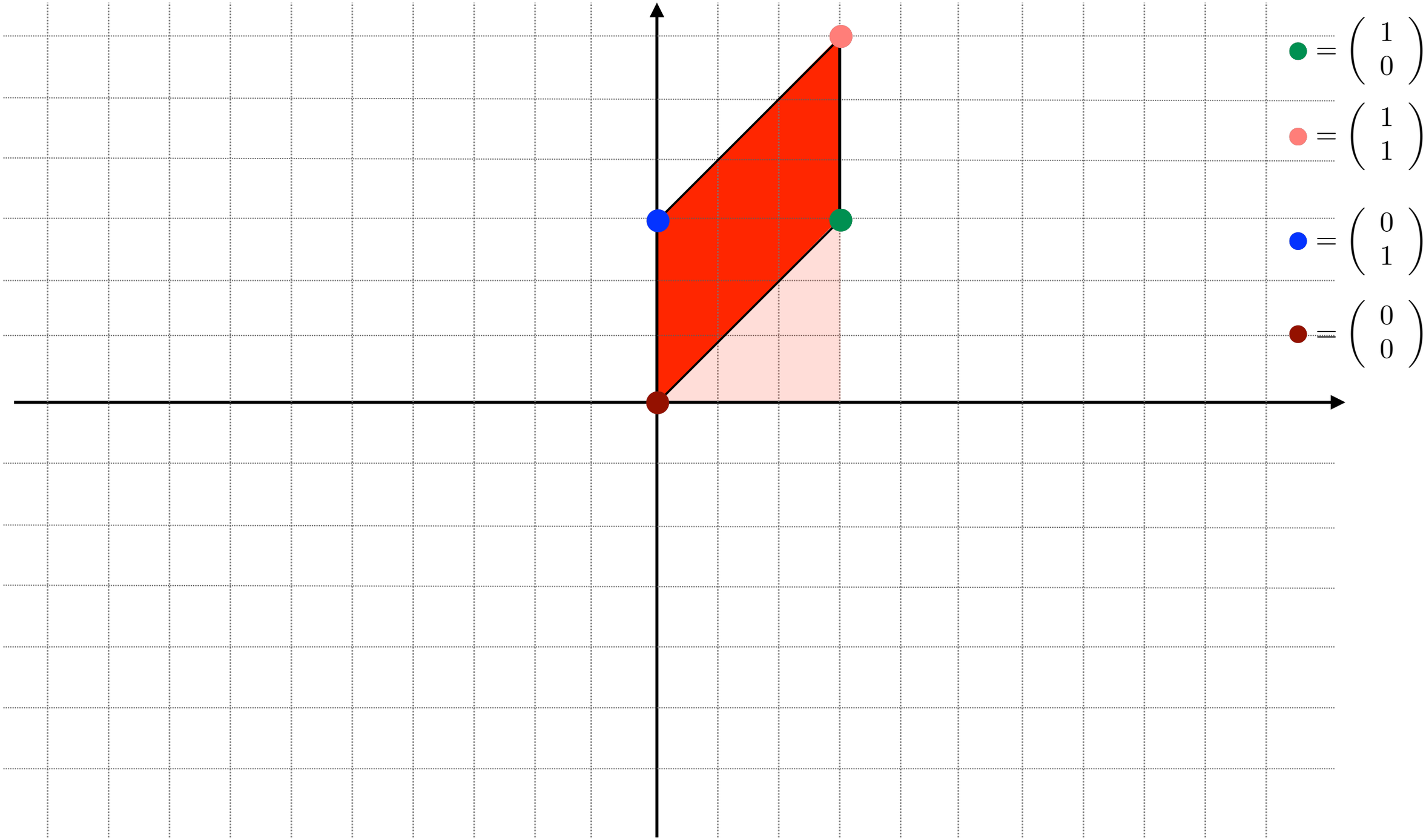
$$\begin{pmatrix} x \\ y \end{pmatrix} \mapsto \begin{pmatrix} 1 & a \\ 0 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$$



# Transvection verticale



# Transvection verticale



# Transvection verticale

$$\begin{pmatrix} x \\ y \end{pmatrix} \mapsto \begin{pmatrix} 1 & 0 \\ a & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$$