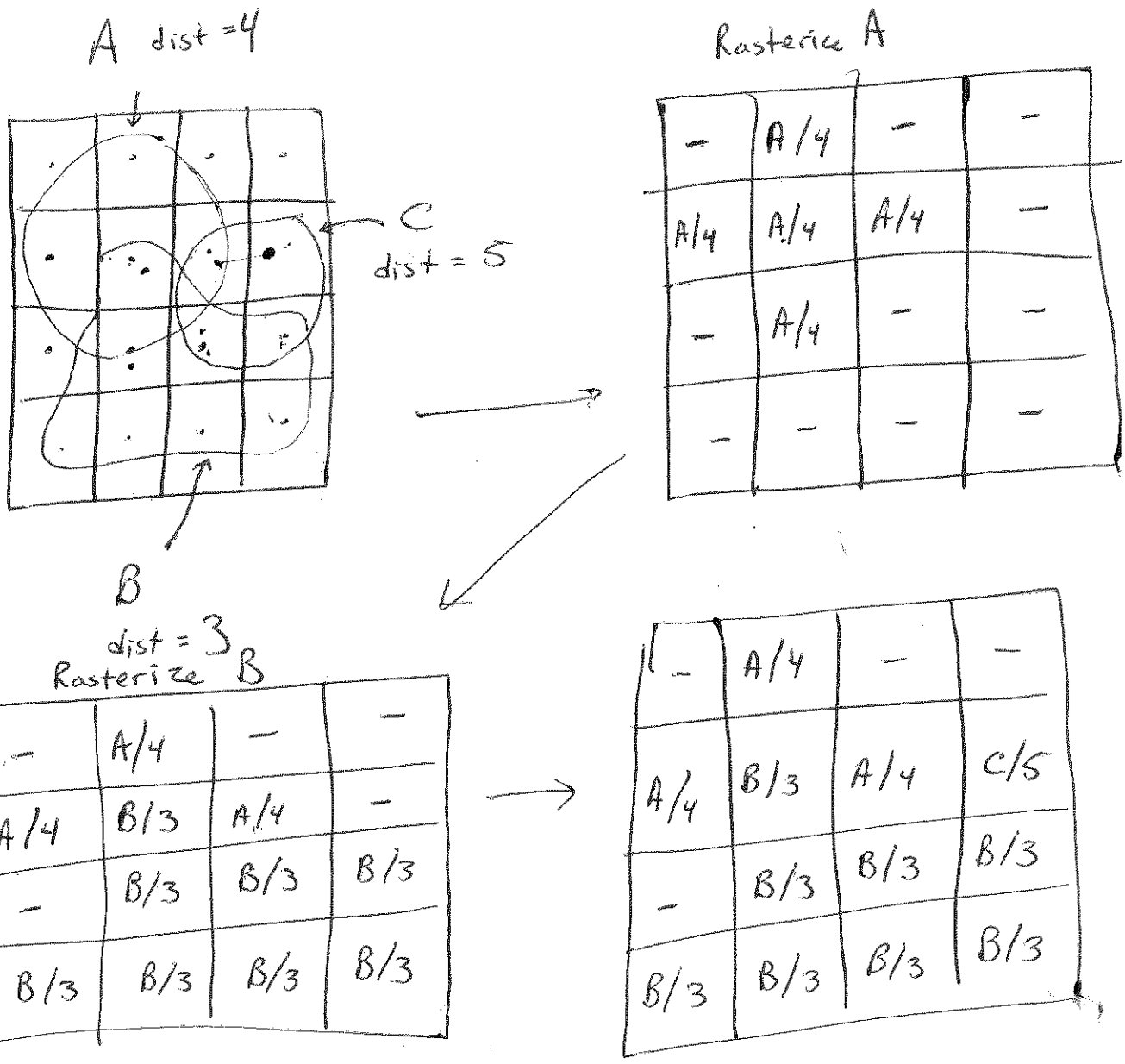

A dist = 4
C
dist = 5
B
dist = 3
Rasterize A
Rasterize B
- A/4 - -
A/4 A/4 A/4 -
- A/4 - -
- - - -
- A/4 - -
A/4 B/3 A/4 -
- B/3 B/3 B/3
B/3 B/3 B/3 B/3
- A/4 - -
A/4 B/3 A/4 C/5
- B/3 B/3 B/3
B/3 B/3 B/3 B/3

Linear Operator

$y = f(x)$ $\qquad x \xrightarrow{f} y$

$f(ax + by) = af(x) + bf(y)$

↑ ↑ vectors

if x is a vector

$y_i = \sum_k A_{ik} x_k \Rightarrow \vec{y} = A\vec{x}$ (A: matrix)

best I can do...

$x \xrightarrow{A} y \xrightarrow{B} z$

$z_m = \sum_{ki} B_{mi} y_i = \sum_{ik} B_{mi} A_{ik} x_k = \sum_k \underbrace{\left(\sum_i B_{mi} A_{ik} \right)}_{C_{mk}} x_k$

$B(Ax) = Cx = (BA)x$

transforms

2D

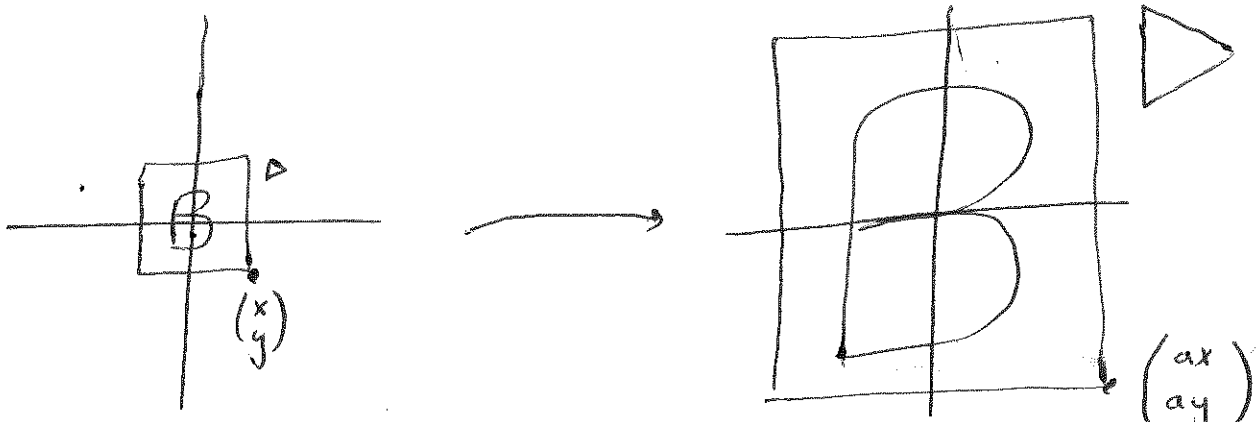
translation

rotation

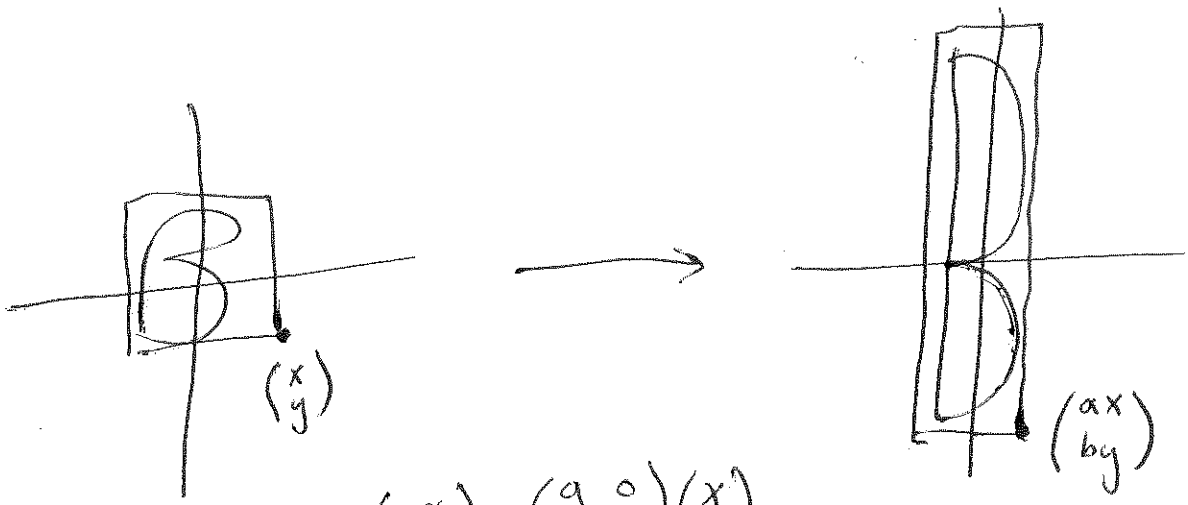
uniform scale

non-uniform scale

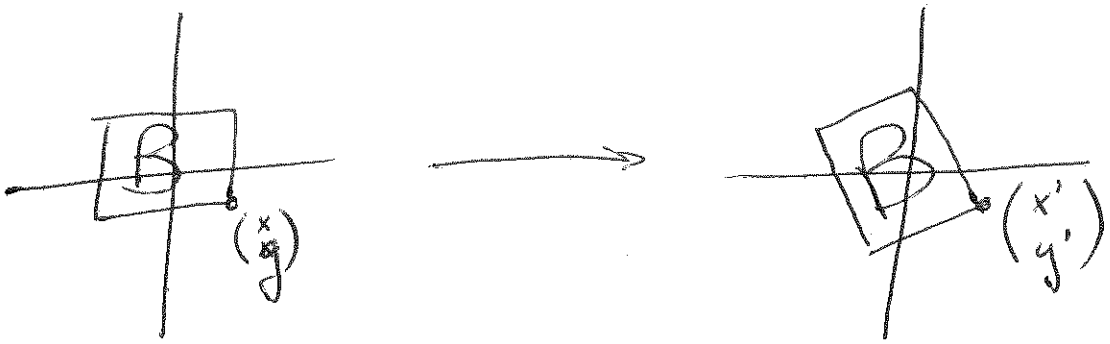
shear



$$\begin{pmatrix} ax \\ ay \end{pmatrix} = \begin{pmatrix} a & 0 \\ 0 & a \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$$



$$\begin{pmatrix} ax \\ by \end{pmatrix} = \begin{pmatrix} a & 0 \\ 0 & b \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$$



$$\begin{pmatrix} x' \\ y' \end{pmatrix} = \begin{pmatrix} \cos\theta & -\sin\theta \\ +\sin\theta & \cos\theta \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$$

$$\left\| \begin{pmatrix} x \\ y \end{pmatrix} \right\|^2 = \left\| \begin{pmatrix} x' \\ y' \end{pmatrix} \right\|^2$$

$$(x')^2 + (y')^2 = (x\cos\theta - y\sin\theta)^2 + (x\sin\theta + y\cos\theta)^2$$

$$= x^2(\cos^2\theta + \sin^2\theta) + y^2(\sin^2\theta + \cos^2\theta)$$

$$\underline{1} \qquad \underline{1} \qquad +2xy(-\cos\theta\sin\theta + \sin\theta\cos\theta)$$

$$= x^2 + y^2$$

$$\begin{pmatrix} x \\ y \end{pmatrix} \cdot \begin{pmatrix} x' \\ y' \end{pmatrix} = \|\vec{x}\| \, \|\vec{x}'\| \cos\theta = \|\vec{x}\|^2 \cos\theta$$

$\vec{x}$ $\vec{x}'$

$$\begin{pmatrix} x \\ y \end{pmatrix} \cdot \begin{pmatrix} x\cos\theta - y\sin\theta \\ x\sin\theta + y\cos\theta \end{pmatrix} = x^2\cos\theta - xy\sin\theta + yx\sin\theta + y^2\cos\theta$$

$$= (x^2 + y^2)\cos\theta$$