SOLUTIONS TO POP QUIZ

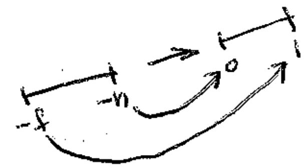
First compute the x transformation:

$$x' = \frac{1}{r-l}(x - l)$$

$$x' = \frac{x}{r-l} - \frac{l}{r-l} \qquad \text{check: } \begin{array}{l} x = l,\ x' = 0 \\ x = r,\ x' = 1 \end{array} \checkmark$$

likewise y:

$$y' = \frac{y}{t-b} - \frac{b}{t-b}$$



z:

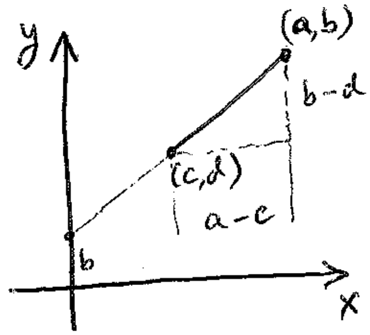
← note the flip:

$$z' = \frac{-1}{-n+f}(z + n) \qquad \text{check: } \begin{array}{l} z = -n,\ z' = 0 \\ z = -f,\ z' = \frac{-(n-f)}{f-n} = \frac{f-n}{f-n} = 1 \end{array} \checkmark$$

$$z' = \frac{-z}{f-n} + \frac{-n}{f-n}$$

$$\boxed{\text{Matrix } M = \begin{bmatrix} \frac{1}{r-l} & 0 & 0 & -\frac{l}{r-l} \\ 0 & \frac{1}{t-b} & 0 & -\frac{b}{t-b} \\ 0 & 0 & \frac{-1}{f-n} & \frac{-n}{f-n} \\ 0 & 0 & 0 & 1 \end{bmatrix}}$$

EFFICIENT LINE EQUATION FROM 2 POINTS (IMPLICIT)



$$f_\ell = (a,b,1) \times (c,d,1)$$

$$= \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ a & b & 1 \\ c & d & 1 \end{vmatrix} = (b-d)\vec{i} - (a-c)\vec{j} + (ad-cb)\vec{k}$$

so $f_\ell = (b-d)x - (a-c)y + (ad-cb)$ ← implicit line equation

if $f_\ell = 0 \Rightarrow$ line equation

$$0 = (b-d)x - (a-c)y + (ad-cb)$$

verify

$$(a-c)y = (b-d)x + (ad-cb)$$

$$y = \frac{(b-d)}{(a-c)}x + \frac{(ad-cb)}{(a-c)}$$

slope m

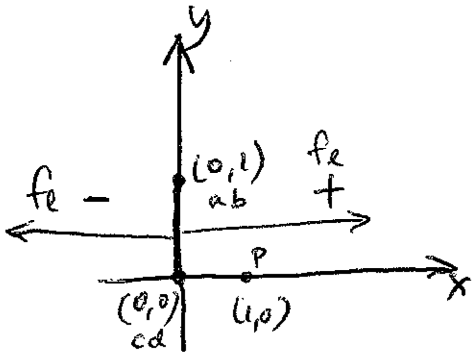
intercept b?

$$b = -\left(\frac{b-d}{a-c}\right)c + d = \frac{\cancel{dc} - bc}{a-c} + \frac{ad - \cancel{cd}}{a-c}$$

$$= \boxed{\frac{ad - bc}{a-c}}$$

So this is correct.

USING IMPLICIT LINE EQUATION TO TEST FOR "SIDEDNESS" 2



$$f_\ell = x - 0y + (0-0)$$

$$f_\ell = x$$

Plug in point P

$$f_\ell(P) = 1$$