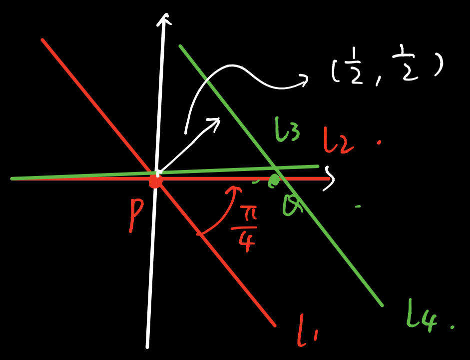
PM 1 #1(d)

Show $\underbrace{R^{Q}_{(1,0),-\frac{\pi}{2}}}_{r_4 r_3} \circ \underbrace{R^{P}_{(0,0),\frac{\pi}{2}}}_{R_2 r_1} = t(1,1)$

$= \bar{r}_4 \circ \bar{r}_1$

$= t(1,1)$



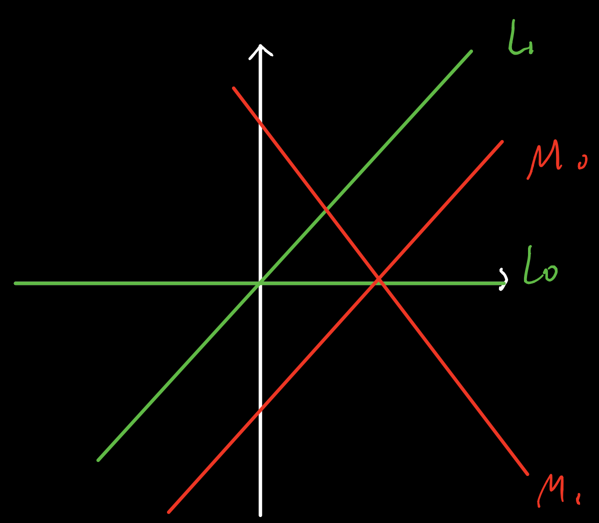

PM 1 #2b: Prove that $\underbrace{\bar{r}_{M_1} \circ \bar{r}_{M_0}}_{rot} \circ \underbrace{\bar{r}_{L_1} \circ \bar{r}_{L_0}}_{rot}$ is a rotation.

$L_0 = \{y = 0\}$.

$L_1 = \{x = y\}$.

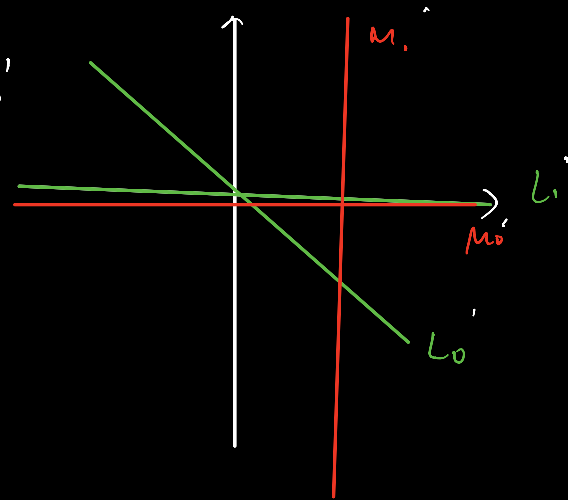
$M_0 = \{x = y + 1\}$.

$M_1 = \{x = -y + 1\}$.




$\Downarrow$

$$M_1 M_0 L_1 L_0 = M_1' M_0' L_1' L_0' = M_1' L_0' = \boxed{Rot}$$



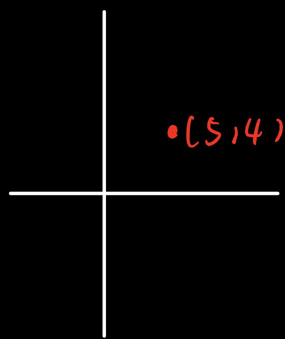

Sec. 1.3: The compo. $r_M \circ r_L$ is a (a) rotation iff $M, L$ cross at $p$.

(b) Translation iff $M \parallel L$.

(c) identity iff $M = L$.

Sec 1.4: Any isometries is a product of 1, 2, 3 reflections.

Write a formula for $R_{(5,4),\theta}$ for any $\theta$




$$R_{(5,4),\theta} = t_{(5,0)} R_\theta t^{-1}_{(5,4)}$$

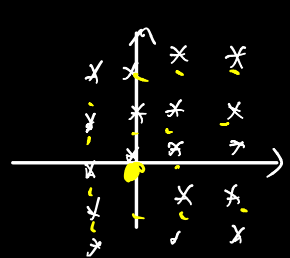
$$= t_{(5,4)} \circ \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$$

$$(x,y) \xmapsto{(-5,-4)} (x-5,\, y-4) \xmapsto{\theta} ((x-5)\cos\theta - (y-4)\sin\theta,\ (x-5)\sin\theta + (y-4)\cos\theta)$$

— END OF CH1 —

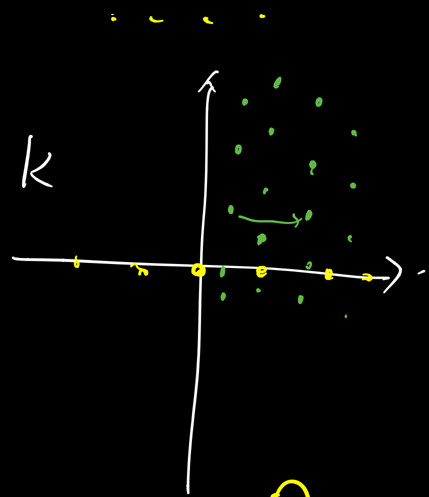
Find the distances in $T$ (torus) & $K$ (klein bottle) for $P = (2, 3.25)$ $Q = (5,-1) = (0,0)$

$R = (0, 21,25) = P$



$d(P,Q) = 0.25 = d_T(R,Q)$

$d(P,R) = 0$



$(x, y)$

$\sim (x+n, (-1)^n y + m)$.

$P = (2, 3.25)$

$R = (0, 21.25)$

$= (2, 3.25)$

$Q = (5, -1)$

$= (5, 0)$

$= (0, 0)$

$d_K(P, Q) = 0.25 = d_K(R, Q)$

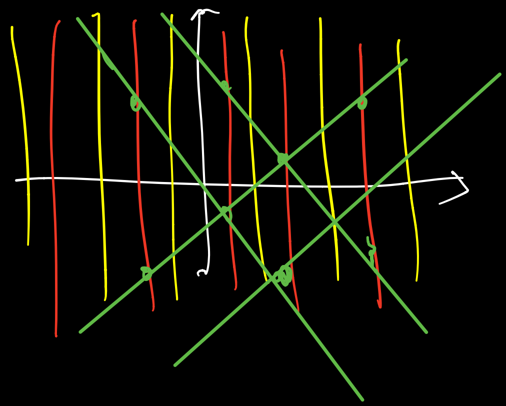
$d_K(P, R) = 0$

PM1 # 4 (b)

$M = \mathbb{R}^2/\Gamma \qquad \Gamma = \langle t_{(1,0)} \circ \bar{r} \rangle$

Find all intersections of $M = \{x = -4\}$

$L = \{x = 0.5\}$



$$\pi(M) \cap \pi(L)$$

$$= \left\{ \left(\tfrac{1}{2}, -\tfrac{1}{2} + 2n\right) ; n \in \mathbb{Z} \right\}$$

See also PM #2. 3(c)