1.) $P(x, y) = (4, 2)$

$A(x_1, y_1) = (1, 0)$

$B(x_2, y_2) = (3, 7)$

$(x_2 - x_1)(y - y_1) - (y_2 - y_1)(x - x_1)$

$(3 - 1)(2 - 0) - (7 - 0)(4 - 1)$

$\cancel{2(2)}\ 4 - 7(3) < 0$

Point Lies to the right of the ~~f~~ Line

2.) Point clipping

Line clipping

Polygon clipping

Polygon window clipping

3.) $x_{min} = 4$ $y_{min} = 2$

$x_{max} = 10$ $y_{max} = 5$

L1:- $A(1,1)$ $B(3,7)$
$\quad x_1\ y_1 \quad x_2\ y_2$

$\Delta x = 2$ $\Delta y = 6$

$p_1 = -2$ $q_1 = 1-4 = -3$

$p_2 = 2$ $q_2 = 10-1 = 9$

$p_3 = -6$ $q_3 = 1-2 = -1$

$p_4 = 6$ $q_4 = 5-1 = 4$

$p_k \neq 0$ π_1
$k = 0,1,2,3$

$$u_1 = \max\left\{0, \frac{q_1}{p_1}, \frac{q_3}{p_3}\right\} = \max\left\{0, \frac{+3}{+2}, \frac{+1}{+6}\right\}$$

$$u_2 = \min\left\{1, \frac{q_2}{p_2}, \frac{q_4}{p_4}\right\} = \min\left\{1, \frac{9}{2}, \frac{4}{6}\right\}$$

$u_1 = 3/2$ $u_2 = 2/3$

$u_1 > u_2$ => discard

L_2 :- $A(5, 0)$ $B(2, 3)$
$\quad\quad x_1 \; y_1$

$\Delta x = -3 \quad \Delta y = 3$

$p_1 = 3 \qquad q_1 = 5 - 4 = 1$

$p_2 = -3 \qquad q_2 = 10 - 5 = 5$

$p_3 = -3 \qquad q_3 = -2$

$p_4 = 3 \qquad q_4 = 5$

$p_k \neq 0$

$$u_1 = \max\left\{0, \frac{5}{-3}, \frac{+2}{+3}\right\}$$

$$u_2 = \min\left\{1, \frac{1}{3}, \frac{5}{3}\right\}$$

$u_1 = 2/3 \qquad u_2 = 1/3$

$u_1 > u_2 \Rightarrow$ discard

L_3 :- $A(4, 5)$ $B(9, 8)$
$\quad\quad x_1 \; y_1$

$\Delta x = 5 \quad \Delta y = 3$

$p_1 = -5 \qquad q_1 = 4 - 4 = 0$

$p_2 = 5 \qquad q_2 = 10 - 4 = 6$

$p_3 = -3 \qquad q_3 = 5 - 2 = 3$

$p_4 = 3 \qquad q_4 = 5 - 5 = 0$

$A' = (4, 5)$

~~$B' = (9, 8)$~~

$B' = (4, 5)$

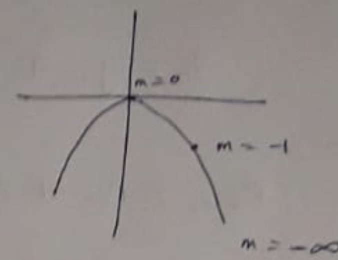
$p_k \neq 0 \quad u_1 = M\left\{0, \frac{0}{-5}, \frac{3}{-3}\right\} \quad u_2 = m\left\{1, \frac{6}{5}, \frac{0}{3}\right\}$

$u_1 = 0 \qquad u_2 = 0$

4.) $x^2 = -4ay$

$2x\,dx = -4a\,dy$

$\frac{dy}{dx} = \frac{2x}{-4a} = \frac{x}{-2a}$



Region 1 :

$m > -1$

$\frac{dy}{dx} > -1 \qquad dx > dy$

$(x_k + 1 \,, \; y_k - 1/2)$

$P_k = (x_k + 1)^2 + 4a(y_k - 1/2) = 0$

$P_{k+1} = (x_{k+1} + 1)^2 + 4a(y_{k+1} - 1/2) = 0$

$P_{k+1} - P_k = \cancel{(x_{k+1})^2 - (x_k)^2 - 2}$

$\left[(x_{k+1})^2 + \cancel{1} + 2x_{k+1} + 4a\,y_{k+1} - 2\cancel{a} \right] -$

$\left[x_k^2 + \cancel{1} + 2x_k + 4a\,y_k - 2\cancel{a} \right]$

$P_{k+1} = P_k + (x_{k+1})^2 - x_k^2 + 2(x_{k+1} - x_k) + 4a[y_{k+1} - y_k]$

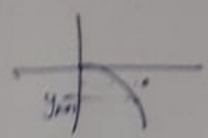
$P_k < 0 \Rightarrow y_k = y_k \,, \; x_k = x_k + 1$

$P_{k+1} = P_k + (x_k + 1)^2 - x_k^2 + 2[1] + 4a[0]$

$= P_k + 1 + 2x_k + 2$

$= P_k + 2x_k + 3$

$P_k > 0$



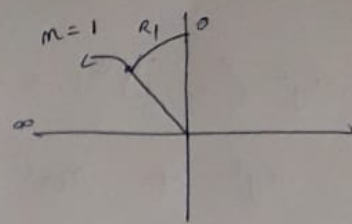
$y_k = y_k - 1 \qquad x_k = x_k + 1$

$$P_{k+1} = P_k + (x_k + 1)^2 - x_k^2 + 2(1)$$

$$+ 4a\,[y_k - 1 - y_k]$$

$$= P_k + 1 + 2x_k + 2 + 4a(-1)$$

5.) $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$



$$\frac{dy}{dx} = \frac{-b^2 x}{a^2 y}$$

$$\left(x_k - 1\ ,\ y_k - \tfrac{1}{2}\right)$$

$m < 1$

$\frac{dy}{dx} < 1 \Rightarrow dy < dx$

$P_{1k} \Rightarrow r_y^2 (x_k - 1)^2 + r_x^2 (y_k - \tfrac{1}{2})^2 - r_x^2 r_y^2 = 0$

$P_{k+1} = r_y^2 (x_{k+1} - 1)^2 + r_x^2 (y_{k+1} - \tfrac{1}{2})^2 - r_x^2 r_y^2 = 0$

$$P_{k+1} - P_k = r_y^2 \left[(x_{k+1} + x_k - 2)(x_{k+1} - x_k) \right] + r_x^2 \left[(y_{k+1} + y_k - 1)(y_{k+1} - y_k) \right]$$

$P_k < 0$

$y_{k+1} = y_k \ ,\ x_{k+1} = x_k - 1$

$\Rightarrow r_y^2 (2x_{k+1} - 1)(-1) + r_x^2 [0]$

$P_{k+1} = P_k + r_y^2 (-2x_k + 3)$

$= P_k - \cancel{2}\, r_y^2 (2x_k - 3)$

$y_k - 1 + y_k - 1$
$2y_k - 2$

$P_k > 0 \quad y_{k+1} = y_k - 1 \quad x_{k+1} = x_k - 1$

$P_{k+1} = P_k + r_y^2 (2x_k - 3)(-1) + r_x^2 (-1)(2y_k - 2)$

$\cancel{P_0 = P_k(0, b) = r_y^2 + }$

$P_{10} =$

$$r_y^2 (0-1)^2 + r_x^2 (r_y - 1/2)^2 - r_x^2 r_y^2$$

$$r_y^2 + r_x^2 (r_y^2 + 1/4 - 2r_y) - r_x^2 r_y^2$$

$$P_{10} = r_y^2 + \frac{r_x^2}{4} - r_x^2 r_y$$

$\boxed{r_y^2 |x| < r_x^2 |y_{..}|}$

$a = 5 , b = 7 , c(7,9)$

$$P_0 = 7^2 + \frac{25}{4} - 25 \cdot 7 = 55.25 - 175 = -119.75$$

$(0, 7)$

$$P_1 = -119.75 - 49(-3) = 27.25$$

$(-1, 7)$

$$P_2 = 49 (2(-1) + 3)(-1) + 25(-1)(14-2) + 27.25$$

$$= 49(-5) + 25(-1)(12) + 27.25$$

$$= \cancel{-349 + 27.25 = -321.75} -245 + -300 + 27.25$$

$$= -517.75$$

$(-2, 6)$

$$P_3 = -\cancel{349}\ \cancel{321.75}\ 517.75 - 49(2(-2)-3)$$

$$= -\cancel{349}\ \cancel{321.75}\ 517.75 + 49(+7)$$

$$= \cancel{+ 22.25} - 174.75$$

$(-3, 6)$

$$P_4 = -21.25 - 49(2(-3)-3)$$
$$= -21.25 + 49(+9)$$
$$= 435$$

$(-4, 6)$

~~49~~

~~$P_5 = 435$~~

~~$P_4 = 21.25 + 49(2(-3)+3)$~~

$$P_4 = -174.75 - 49(2(-3)-3)$$
$$= -174.75 + 49(+9)$$
$$= 266.25$$

$(-4, 6)$

$$P_5 = 266.25 + 49(2(-4)-3)(-1) + 25(-1)(2(6)-2)$$

$(-5, 5)$

x	y
7	16
6	16
5	15
4	15
3	15
2	14

after translation