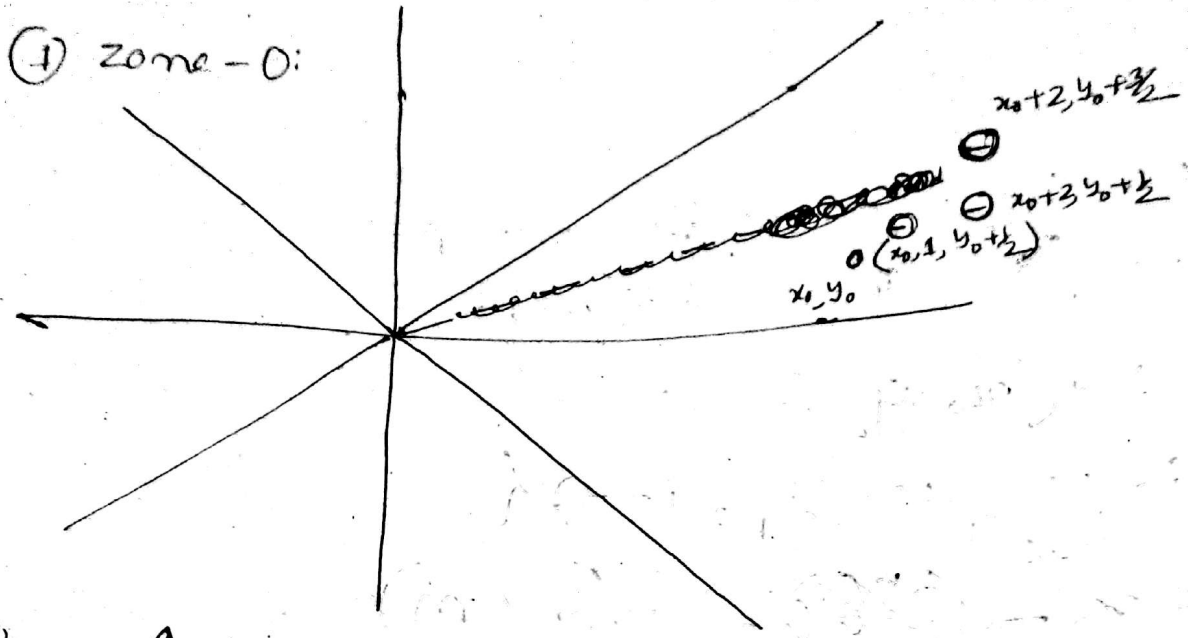
⊛ mid point Line drawing

① zone-0:



So, $Ax + By + C = 0$

$\Rightarrow dy\,x + (-dx)\,y + C = 0$

So, midpoint $M(x_0+1, y_0+1/2)$

$M_1(x_0+2, y_0+1/2)$

$M_2(x_0+2, y_0+3/2)$

$f(M) = A(x_0+1) + B(y_0+1/2) + C$

$\Rightarrow d = A + B/2 = dy - \frac{dx}{2} =$

$f(M_1) = A(x_0+2) + B(y_0+1/2) + C$

$= 2A + \frac{B}{2} = 2\,dy - \frac{dx}{2}$

$$f(M_2) = A(x_0+2) + B(y_0+3/2) + C$$

$$= 2A + \frac{3B}{2}$$

$$= 2dy - \frac{3dx}{2}$$

No, axis বরাবর change

$$f(M_1) - f(M) = 2dy - \frac{dx}{2} - dy + dx/2$$

$$\Rightarrow dE = dy$$

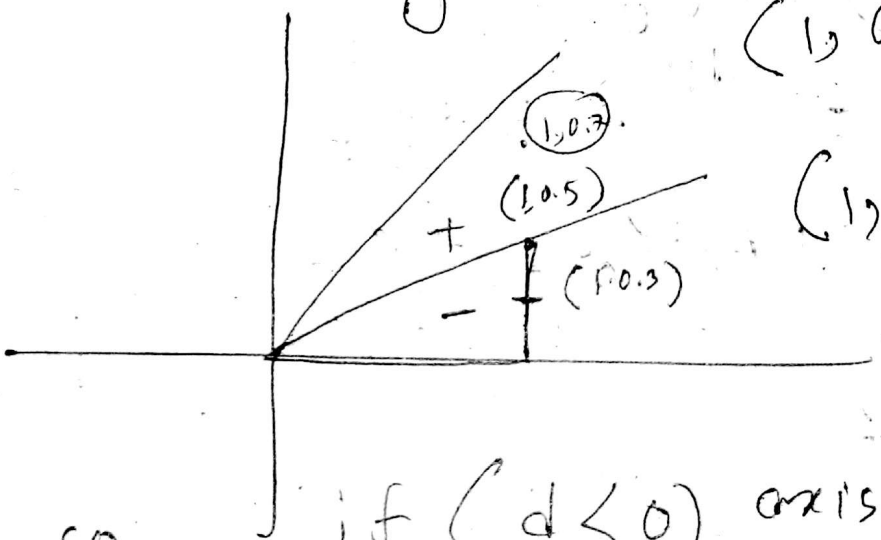
diagonal বরাবর change

$$f(M_2) - f(M) = 2dy - \frac{3dx}{2} - dy + dx/2$$

$$\Rightarrow dNE = dy - \frac{2dx}{2}$$

$$= dy - dx$$

now taking a mid line



$(1, 0.3) \rightarrow f(M) = 0.3 - 0.5$

$= -0.2 < 0$

$(1, 0.7) \rightarrow f(M) = 0.7 - 0.5$

$= 0.7 - 0.5$

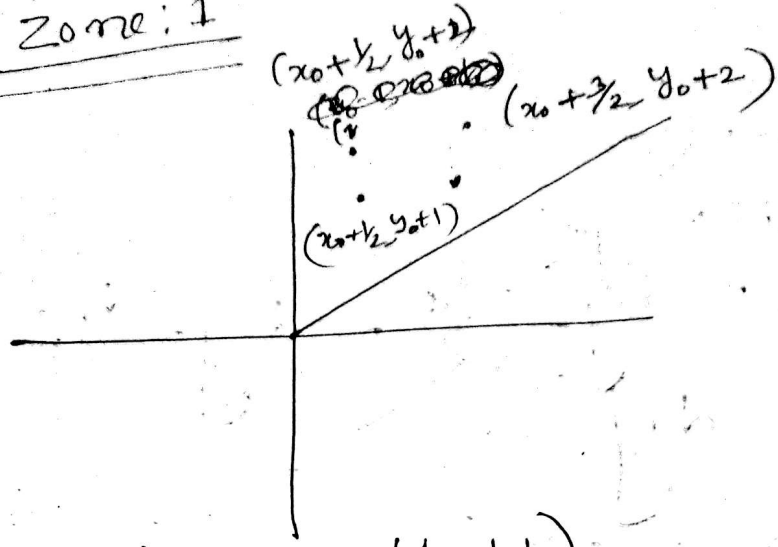
$= 0.2 > 0$

So, if $(d < 0)$ axis বরাবর change

$d = d + dE$, $x++$

else $d = d + dNE$, $x++$, $y++$

Zone: 1



$M\left(x_0+\frac{1}{2}, y_0+1\right)$

$M_1\left(x_0+\frac{1}{2}, y_0+2\right)$

$M_2\left(x_0+\frac{3}{2}, y_0+2\right)$

$$f(M) = A\left(x_0+\tfrac{1}{2}\right)+B(y_0+1)+C$$

$$\Rightarrow d = \frac{A}{2}+B = \frac{dy}{2}-dx$$

$$f(M_1) = A\left(x_0+\tfrac{1}{2}\right)+B(y_0+2)+C$$

$$= \frac{A}{2}+2B = \frac{dy}{2}-2dx$$

$$f(M_2) = A\left(x_0+\tfrac{3}{2}\right)+B(y_0+2)+C$$

$$= \frac{3A}{2}+2B$$

$$= \frac{3dy}{2}-2dx$$

axis বরাবর change

$$f(M_1) - f(M) = \frac{dy}{2} - 2dx - \frac{dy}{2} + dx$$

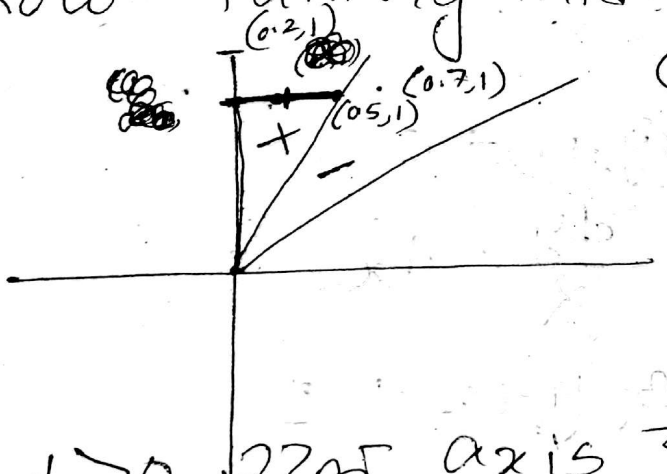
$$\Rightarrow dE = -dx$$

diagonal বরাবর change,

$$f(M_2) - f(M) = \frac{3dy}{2} - 2dx - \frac{dy}{2} + dx$$

$$= dy - dx$$

now taking mid line



(0.2, 1) $d = 0.5 - 0.2 > 0$

(0.7, 1) $d = 0.5 - 0.7 < 0$

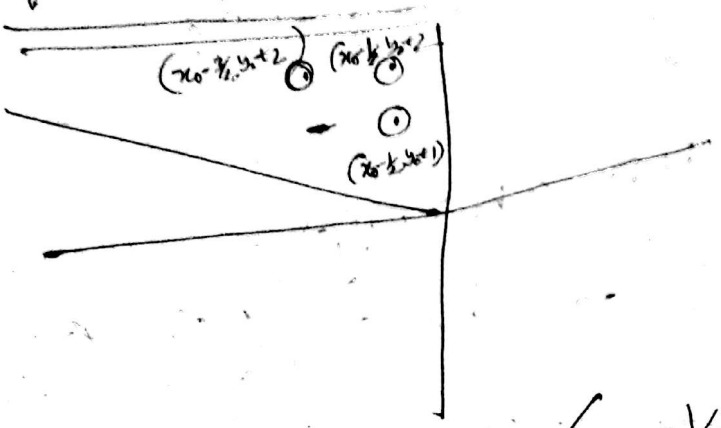
So, $d > 0$ হলে axis বরাবর change

$d = d + dE$, $y++$

$d < 0$ হলে diagonal বরাবর change

$d = d + dNE$ $y++$, $x++$

for zone 2 —



$M(x_0-1/2,\ y_0+1)$ $M_1(x_0-1/2,\ y_0+2)$

$M_2(x_0-3/2,\ y_0+2)$

$f(M) = A(x_0-1/2)+B(y_0+1)+C$

$\Rightarrow d = -A/2 + B = -\frac{dy}{2} - dx$

$f(M_1) = A(x_0-1/2)+B(y_0+2)+C$

$= -\frac{A}{2} + 2B = +\frac{dy}{2} - 2dx$

$f(M_2) = A(x_0-3/2)+B(y_0+2)+C$

$= -\frac{3A}{2} + 2B$

$= -\frac{3dy}{2} - 2dx$

Axis বরাবর change

$f(M_1)-f(M) = -\frac{dy}{2} - 2dx + \frac{dy}{2} + dx$

$\Rightarrow dF = -dx$

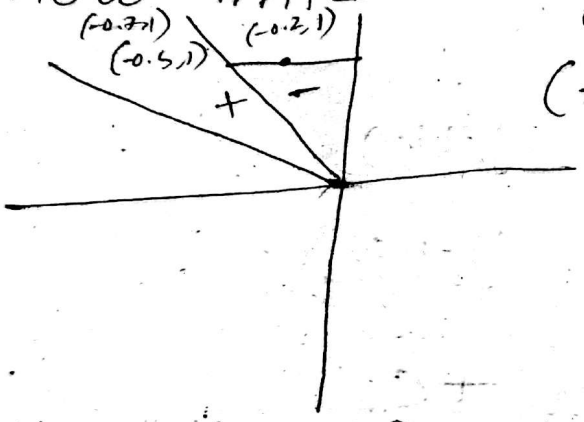
diagonal বরাবর change,

$$f(M_2) - f(M) = -\frac{3dy}{2} - 2dx + \frac{dy}{2} + dx$$

$$= -dy - dx$$

* now mid line (-0.2, 1) $d = -0.5 + 0.2 < 0$

(-0.7, 1) $d = -0.5 + 0.7 > 0$



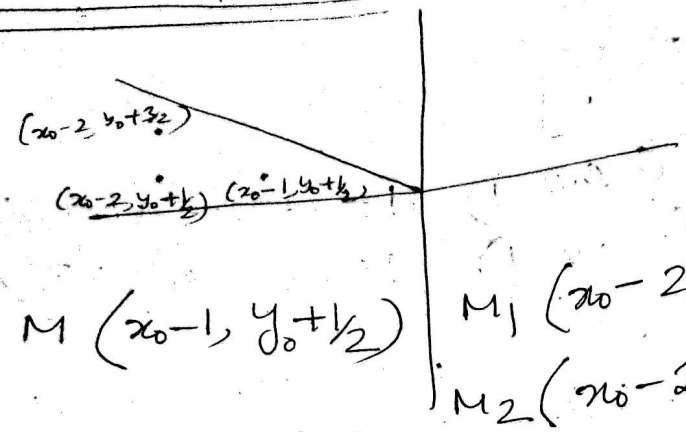
So, if ($d < 0$) → axis বরাবর change

$d = d + dE$ ~~x++~~ y++,

else $d = d + dNE$

y++, ~~x++~~ x--

for zone 3



$M(x_0-1, y_0+1/2)$ | $M_1(x_0-2, y_0+1/2)$, $M_2(x_0-2, y_0+3/2)$

$$f(M) = A(x_0-1) + B(y_0+1/2) + C$$

$$\Rightarrow d = -A + B/2 = -dy - dx/2$$

$$f(M_1) = A(x_0-2) + B(y_0+1/2) + C$$

$$= -2A + B/2 = -2dy - dx/2$$

$$f(M_2) = A(x_0-2) + B(y_0+3/2) + C$$

$$= -2A + 3B/2 = -2dy - 3dx/2$$

So, axis বরাবর change

$$f(M_1) - f(M) = -2dy - \frac{dx}{2} + dy + dx/2$$

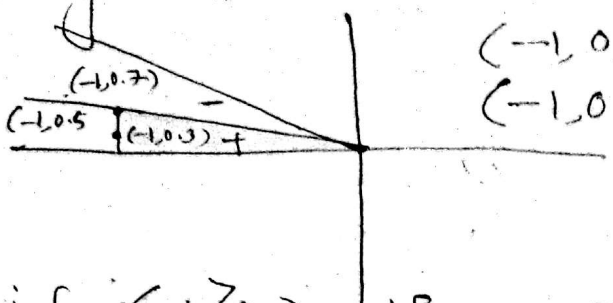
$$\Rightarrow dE = -dy$$

nal

$$f(M_2) - f(M) = -2dy - \frac{3dx}{2} + dy + dx/2$$

$$\Rightarrow dNE = -dy - dx$$

taking mid line



$(-1, 0.3)$ $d = -0.3 + 0.5 > 0$

$(-1, 0.7)$ $d = -0.7 + 0.5 < 0$

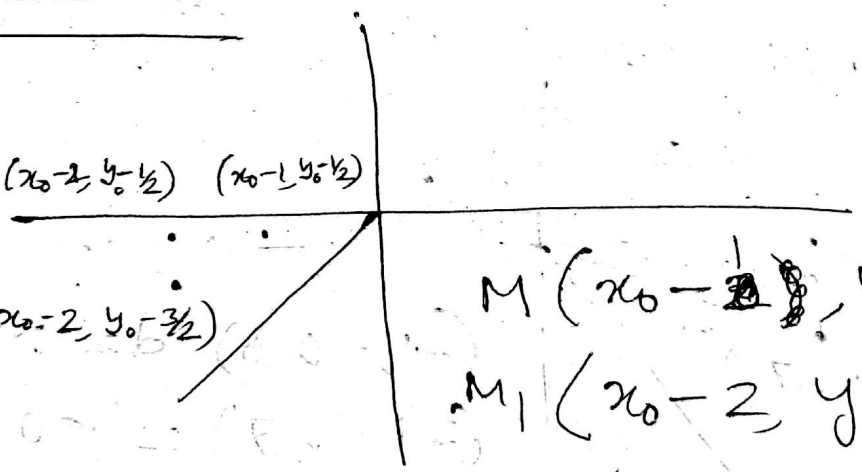
so, if $(d < 0)$ then axis বরাবর change

$d = d + dE$, $x--$

else $d = d + dNE$

$x--$, $y++$

for zone 4:



$M(x_0 - 1, y_0 - 1/2)$

$M_1(x_0 - 2, y_0 - 1/2)$

$M_2(x_0 - 2, y_0 - 3/2)$

$f(M) = A(x_0 - 1) + B(y_0 - 1/2) + C$

$\Rightarrow d = -A - B/2 = -dy + \frac{dx}{2}$

$f(M_1) = A(x_0 - 2) + B(y_0 - 1/2) + C$

$= -2A - B/2 = -2dy + dx/2$

$f(M_2) = A(x_0 - 2) + B(y_0 - 3/2) + C$

$= -2A - 3B/2$

$= -2dy + 3dx/2$

so, axis বরাবর change

$f(M_1) - f(M) = -2dy + \frac{dx}{2} + dy - dx/2$

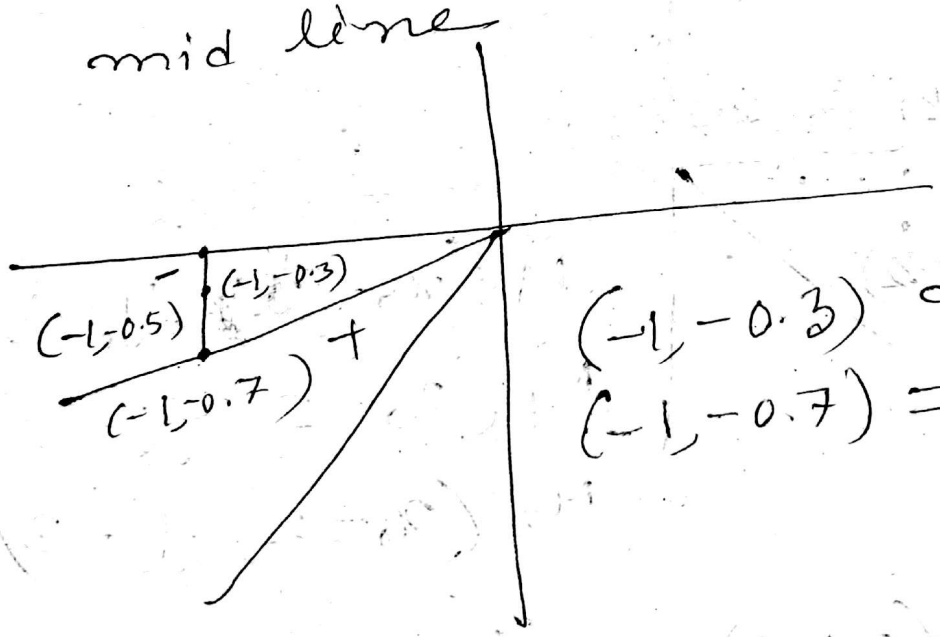
$\Rightarrow dE = -dy$

diagonal বরাবর change

$f(M_2) - f(M) = -2dy + \frac{3dx}{2} + dy - dx/2$

$\Rightarrow dNE = dx - dy$

now mid line



$(-1, -0.3)$ $d = 0.3 - 0.5$

$(-1, -0.7) = -0.7 - 0.5$

if $(d < 0)$ change axis বরাবর $x+$

$d = d + dE$

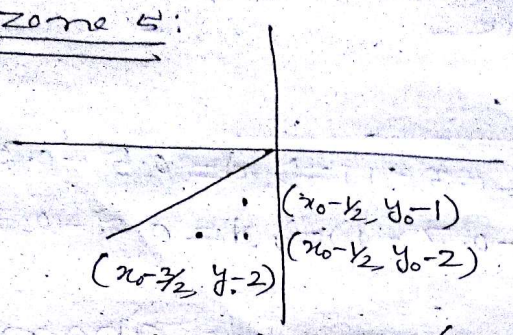
else

$d = d + dNE$

$x--$,

$y--$

For zone 5:



$M(x_0-1/2, y_0-1)$ $M_1(x_0-1/2, y_0-2)$ $M_2(x_0-3/2, y_0-2)$

$f(M) = A(x_0-1/2) + B(y_0-1) + C$

$= -A/2 - B = -dy/2 + dx \rightarrow$

$f(M_1) = A(x_0-1/2) + B(y_0-2) + C \rightarrow$

$= -A/2 - 2B = -dy/2 + 2dx \rightarrow$

$f(M_2) = A(x_0-3/2) + B(y_0-2) + C \rightarrow$

$= -3A/2 - 2B = -\frac{3dy}{2} + 2dx \rightarrow$

So, x axis change

$f(M_1) - f(M) = -\frac{dy}{2} + 2dx + \frac{dy}{2} - dx \rightarrow$

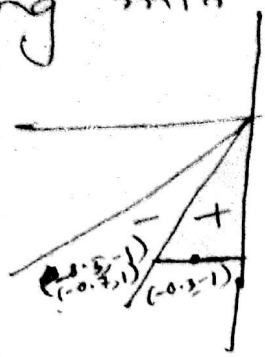
$\Rightarrow dE = dx \rightarrow$

diagonal change $\rightarrow$

$f(M_2) - f(M) = -\frac{3dy}{2} + 2dx + \frac{dy}{2} - dx$

$\Rightarrow dNE = -dy + dx \rightarrow$

taking mid line



$(-0.3,-1) \Rightarrow d = 0.5 - 0.3 > 0$

$(-0.7,-1) \Rightarrow d = 0.5 - 0.7 < 0$

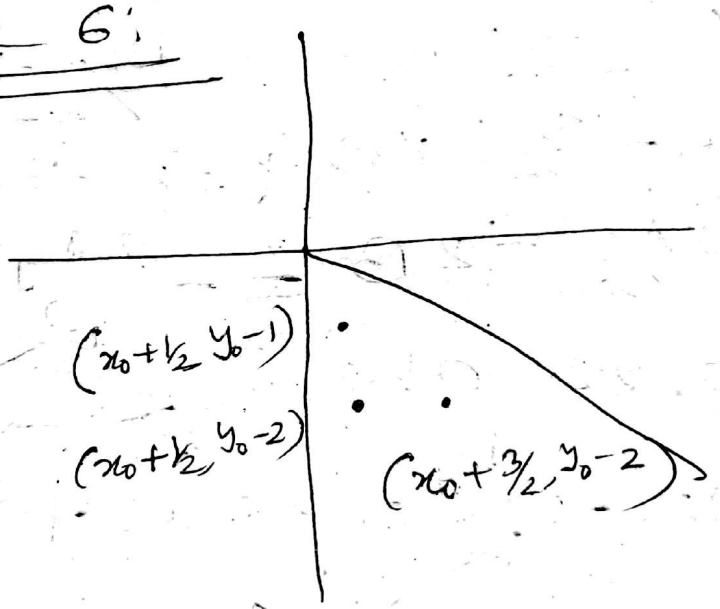
so, $d > 0$ হলে axis বরাবর change.

$d = d + dE$, y--

else $d = d + dNE$

y--, x++,

for zone 6:



$M(x_0+1/2, y_0-1)$ $M_2(x_0+3/2, y_0-2)$

$M_1(x_0+1/2, y_0-2)$

$f(M) = A(x_0+1/2) + B(y_0-1) + C$

$= A/2 - B = dy/2 + dx$

$(M_1) = A(x_0+1/2) + B(y_0-2) + C$

$= A/2 - 2B = dy/2 + 2dx$ ——

$f(M_2) = A(x_0 + 3/2) + B(y_0 - 2) + C$ ——

$= 3A/2 - 2B$

$= 3dy/2 + 2dx$ ——

axis বরাবর change

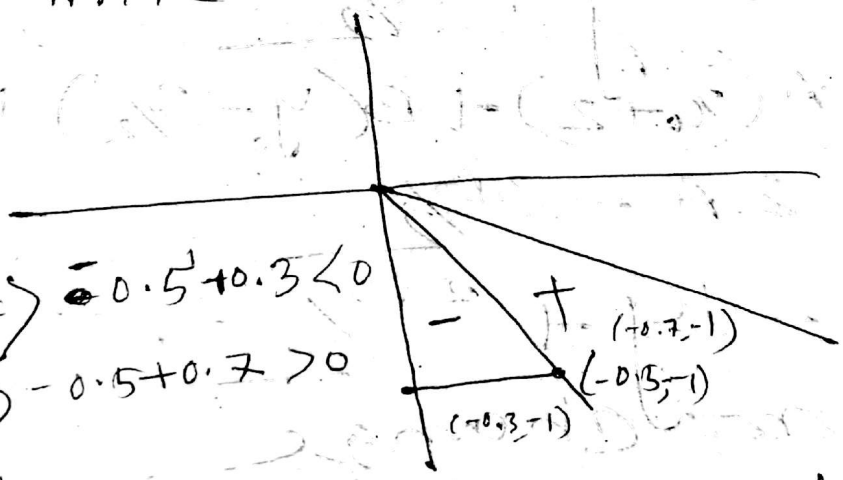
① $f(M_1) - f(M) = dy/2 + 2dx - dy/2 - dx$ ——

$\Rightarrow dE = dx$ ——

$f(M_2) - f(M) = \frac{3dy}{2} + 2dx - \frac{dy}{2} - dx$ ——

$\Rightarrow dNE = dy + dx$ ——

taking mid line ——



$(-0.3, -1) \Rightarrow -0.5 + 0.3 < 0$

$(-0.7, -1) \Rightarrow -0.5 + 0.7 > 0$

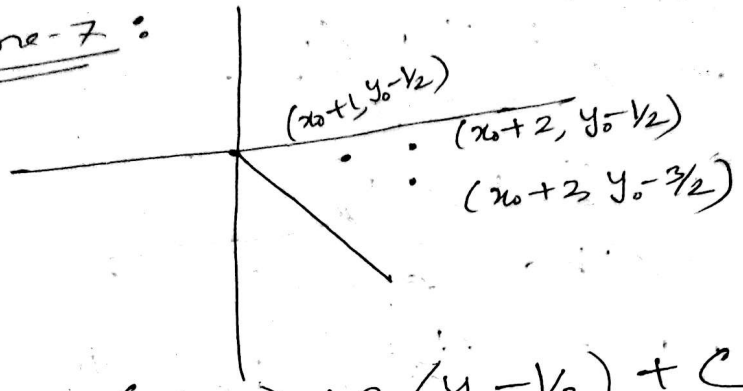
So, if $(d < 0)$ axis বরাবর change

$d = d + dE$, $y--$

else $d = d + dNE$

$y--, x++$

for zone-7 :



$f(M) = A(x_0+1) + B(y_0-1/2) + C$

$\Rightarrow d = A - B/2 = dy + dx/2$

$f(M_1) = A(x_0+2) + B(y_0-1/2) + C$

$= 2A - B/2$

$= 2dy + dx/2$

$f(M_2) = A(x_0+2) + B(y_0-3/2) + C$

$= 2A - 3B/2$

$= 2dy + 3dx/2$

now, axis বরাবর change

$f(M_1) - f(M) = 2dy + dx/2 - dy - dx/2$

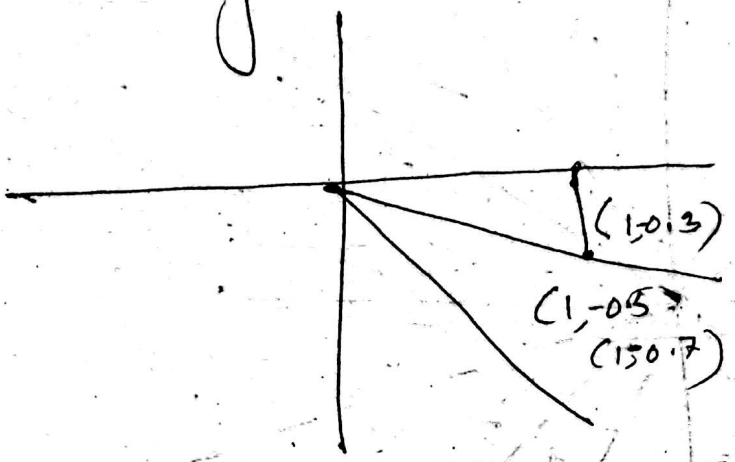
$= dy$

diagonal বরাবর change

$f(M_2) - f(M) = 2dy + 3dx/2 - dy - dx$

$= dy + dx$

now taking mid line



$(1, -0.3) \Rightarrow d = -0.3 + 0.5 > 0$

$(1, -0.7) \Rightarrow d = -0.7 + 0.5 < 0$

if $(d < 0)$ then axis ~~diagonal~~ ... change

$d = d + dE,\ x++$

else $d = d + dNE,\ x++,\ y--$.

~~Summary~~

Summary: