

Assignment 1

1) (1, -4) to (5, 6)

$$\text{here, } m = \frac{y_1 - y_2}{x_1 - x_2} = \frac{-4 - 6}{1 - 5} = 2.5$$

as $m > 1$ then, $\Delta x = \frac{x_2 - x_1}{m} = \frac{5 - 1}{2.5} = 1.6$

$$y_{k+1} = y_k + 1$$

$$x_{k+1} = x_k + \frac{1}{m} = x_k + 0.4$$

$\Delta y = 1$

y	x (Observation)	x (round off)	Pixel
-4	1	1	(1, -3)
-3	1.4	2	(2, -2)
-2	1.8	2	(2, -1)
-1	2.2	3	(3, 0)
0	2.6	3	(3, 1)
1	3	3	(3, 2)
2	3.4	4	(4, 3)
3	3.8	4	

<u>x</u>	<u>y</u>	<u>$x(\text{roundoff})$</u>	<u>pixel</u>
4	4.2	4	(4, 4)
5	4.6	5	(5, 5)

(ii) (10, 9) to (2, 5)

$$m = \frac{9-5}{10-2} = 0.5$$

as, $-1 < m < 1$, so, $x_{k+1} = x_k + 1$

$$y_{k+1} = y_k + m = y_k + 0.5$$

<u>x</u>	<u>y</u>	<u>$y(\text{roundoff})$</u>	<u>pixel</u>
10 2	9 5		(10, 9)
11 3	9.5 5.5		
12 4	10 6		
2	5		(3, 6)
3	5.5	6	(4, 6)
4	6	7	(5, 7)
5	6.5	7	(6, 7)
6	7	8	(7, 8)
7	7.5		

x	y	$y(\text{round off})$	pixel
8	8	8	(8,8)
9	8.5	9	(9,9)

endpoints are (3,10) and (10,15)

$dx = 7$
 $dy = 5$

x	y	d	NE(+1,+1) /E(+1,0)	update	pixel
3	10	3	NE	-1	(3,10)
4	11	-1	E	9	(4,11)
5	11	9	NE	5	(5,11)
6	12	5	NE	-1	(6,12)
7	13	1	NE	-3	(7,13)
8	14	-3	E	7	(8,14)
9	14	7	NE	3	(9,14)
10	15	3	NE	-1	(10,15)

(Ans)

6 Given endpoints $(1, -4)$ and $(-5, -9)$

~~$dy = 1 - (-5) = 6$~~

~~$dx =$~~

$dx = 1 - (-5) = 6$

$dy = -4 - (-9) = 5$

$d_{init} = 2 dy - dx = 4$

x	y	d	NE(+1,+1)/ E(+1,0)	d-update	pixel
-5	-9	4	NE	2	$(-5, -9)$
-4	-8	2	NE	0	$(-4, -8)$
-3	-7	0	E	10	$(-3, -7)$
-2	-7	10	NE	8	$(-2, -7)$
-1	-6	8	NE	6	$(-1, -6)$
0	-5	6	NE	4	$(0, -5)$
1	-4	4	NE	2	$(1, -4)$
					(Ans)

[2]

Zone finding method

def findzone(x_1, y_1, x_2, y_2):

$$dx = x_2 - x_1$$

$$dy = y_2 - y_1$$

if ($\text{abs}(dx) > \text{abs}(dy)$):

if ($dx > 0$ and $dy > 0$):

return 0

elif ($dx < 0$ and $dy > 0$):

return 3

elif ($dx < 0$ and $dy < 0$):

return 4

elif ($dx > 0$ and $dy < 0$):

return 2

elif ($\text{abs}(dx) \leq \text{abs}(dy)$):

if ($dx > 0$ and $dy > 0$):

return 1

elif (dx < 0 and dy > 0):

return 2

elif (dx < 0 and dy < 0):

return 5

elif (dx > 0 and dy < 0):

return 6

if ((x1) < (x2) and (y1) < (y2)):

convert to zone 0

convert to zone (x, y, zone):

if zone == 1:

x1 = y, y1 = x

elif zone == 2:

x1 = y, y1 = -x

elif zone == 3:

x1 = -x, y1 = y

elif zone == 4:

x1 = -x, y1 = -y

elif (zone == 5):

$x_1 = -y, y_1 = -x$

elif (zone == 6):

$x_1 = -y, y_1 = x$

elif (zone == 7):

$x_1 = x, y_1 = -y$

return (x₁, y₁)

convert to original

original (x, y, zone):

if (zone == 1):

$x_1 = y, y_1 = x$

elif (zone == 2):

$x_1 = -y, y_1 = x$

elif (zone == 3):

$x_1 = -x, y_1 = y$

elif (zone == 4):

$x_1 = -x, y_1 = -y$

elif (zone == 5):

$x_1 = -y, y_1 = -x$

elif (zone == 6):

$x_1 = y, y_1 = -x$

elif (zone == 7):

$x_1 = x, y_1 = -y$

return (x₁, y₁)

[4] if starting point is (a, b)

$$\text{and } m = \frac{\Delta y}{\Delta x} = 2.6$$

$$\Delta y = 2.6 \times \Delta x$$
$$= 2.6 \times 4$$

$$\text{end point} = (a + 4, b + 10.4)$$

— o — length of line

[5] for E $(+1, 0)$

for NE $(+1, +1)$

if start is at (a, b)

$$\text{then end point} = (a + (1 \times (4 + 13)), b + (1 \times 13))$$
$$= (a + 17, b + 13)$$

Q (ii)

$$x' = 0$$

$$y' = 10$$

as center at $(-7, -12)$

$$x = x' - 7$$

$$y = y' - 12$$

x'	y'	d	$E(+1, 0) / SE(+1, -1)$	d'	Pin at (x, y)
0	10	-9	(note E)	-6	$(-7, -2)$
1	10	-6	E	-1	$(-6, -2)$
2	10	-1	E	6	$(-5, -2)$
3	10	6	SE	-3	$(-4, -2)$
4	9	-3	E	8	$(-3, -3)$

(ii)

at zone 6,

$$\Rightarrow (x, -7)$$

$$(-7, 2)$$

$$(-6, 2)$$

$$(-5, 2)$$

$$(-4, 2)$$

$$(-3, 3)$$

(Ann)