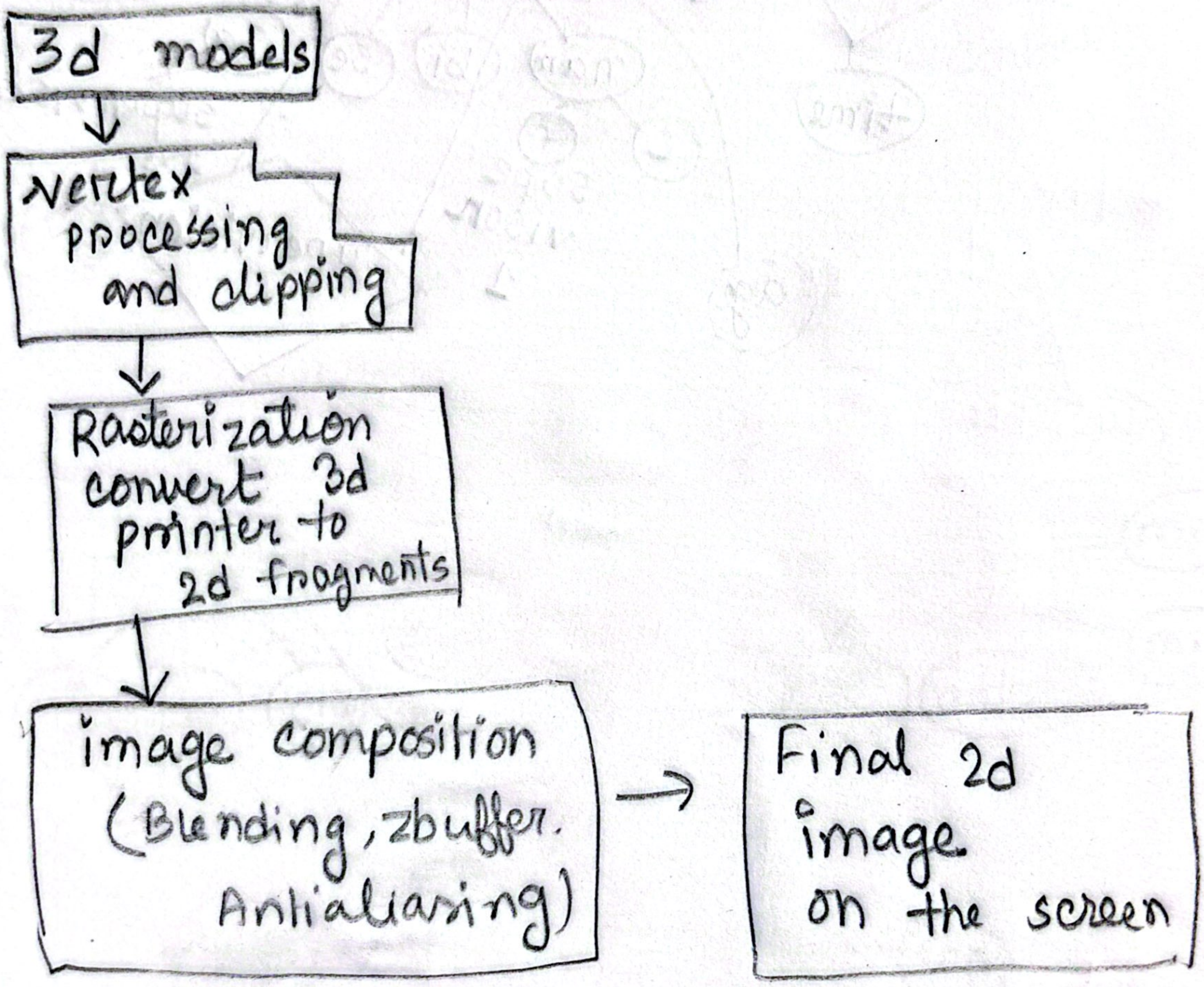
Q1

a. The renderring pipeline is the sequence of steps used in computer graphics to convert a 3D scene into 2d scene on the screen.



6. Aliasing:

- Occurs when a continuous entity is approximatel(by discrete samples.
- Produces jagged or stair-step edges (jaggies) on lines and curves.
- Happens because of an "all-or-nothing" approach to scan conversion: each pixel is either colored or left blank.

Antialiasing:

- Techniques that reduce or elimate aliasing in rendered images.

Antialiasing Techniques

1. Increase Screen Resolution
   - Higher resolution lessens jaggies but is costly (more memory + processing).
   - Only reduces aliasing: doesn't fully eliminate it.
2. Area Sampling
   - A line or shape is treated as a rectangle of finite thickness.
   - Pixel overlapped by this rectangle are colored in proportion to the area covered.
   - Unweighted Area sampling: Coverage is proportional

to overlap area.

- Weighted Area sampling: adds weighting based on distance from center.

Pixel Intensity Equation:

$$I_{x,y} = I_{max} \times dA \times Weight$$

where

$I_{x,y}$ = intensity of the pixel centered at (x, y)

I_{max} = maximum possible intensity

dA = area overlap between pixel tile and object

weight = 1 for unweighted area sampling.

c.

Feature	Raster Display	vector Display
Principle	Pixel-based	Shape-based
Resolution	Fixed resolution	resolution independent
Realism & Appearance	More realistic, supports shaded images and textures.	Best for line drawing; limited shading capabilities.
Hardware Example	Tvs, monitors, laser printers.	Early vector monitors oscilloscops
Memory Use	Requires large memory	Low memory
Use cases	Photographs, realistic, rendering, games.	Fronts, logos. scalable designs
Cost/Speed	Cheaper, simpler to refresh; standard today	More complex beam control.

Q2. a. (44, -17) to (39, -10)

$$m = \frac{-10+17}{39-44} = \frac{7}{-5} = -1.4$$

$$\frac{1}{m} = \frac{-5}{7} = -0.714$$

$dy = 7 \quad dx = -5$

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

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

x	y	Pixel
44	-17	(44, -17)
43.286	-16	(43, -16)
42.572	-15	(43, -15)
41.858	-14	(42, -14)
41.144	-13	(41, -13)
40.43	-12	(40, -12)
39.716	-11	(40, -11)
39.002	-10	(39, -10)

So, pixels are – (44, -17), (43, -16), (43, -15), (42, -14), (41, -13), (40, -12), (40, -11), (39, -10)

b. $7x - 4y + 56 = 0$

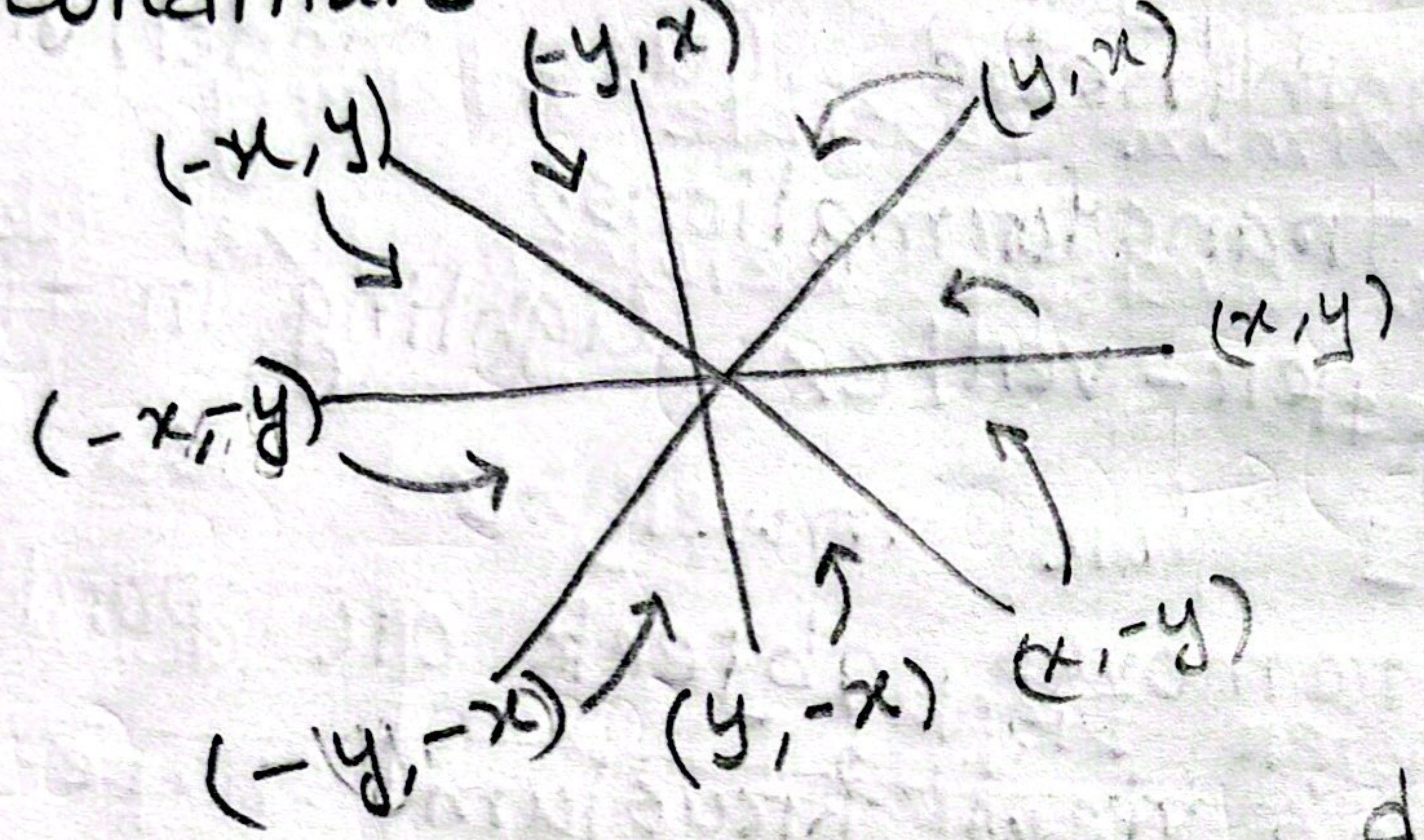
y-axis means $x = 0$

$4y = 56 \Rightarrow y = 14$

$(0, 14)$ to $(10, 5)$

$dx = 10$ $dy = -9$

4th cordinate $dx > dy$. so zone 7.



$dx = 10$
$dy = 9$

$d_{init} = 8$
$d_{NE} = -2$
$d_E = 18$

zone 7 to zone 0

$(0, 14) \longrightarrow (0, -14)$
$(10, 5) \rightarrow (10, -5)$

x	y	dinit	NE/E	dnew	Pixel(Zone0)	Pixel(Zone 7)
0	-14	8	NE	6	(1, -13)	(1, 13)
1	-13	6	NE	4	(2, -12)	(2, 12)
2	-12	4	NE	2	(3, -11)	(3, 11)
3	-11	2	NE	0	(4, -10)	(4, 10)
4	-10	0	E	18	(5, -10)	(5, 10)
5	-10	18	NE	16	(6, -9)	(6, 9)
6	-9	16	NE	14	(7, -8)	(7, 8)

Pixels are - (0,14), (1,13), (2,12), (3,11), (4,10) (5,10), (6,9), (7,8)