

Line art project

We want to construct an image using only line segments. In mathematical language lines are always straight objects. Line segments are pieces of lines. We can define line segments several different ways. Suppose we are working in the xy-plane.

Method 1: Define the coordinates of the endpoints of the line segment and connect the points with a straight line segment.

Plot the line segments in the table below. The coordinates are (x,y)

Question 1: What is the smallest x value in the table? _____

Question 2: What is the largest x value in the table? _____

Question 3: What is the smallest y value in the table? _____

Question 4: What is the largest y value in the table? _____

We can calculate the slope of a line $slope = \frac{rise}{run}$ Where the rise is the change in the y

$rise = y_2 - y_1$ and the run is $run = x_2 - x_1$. For example the slope for line segment number 10 is

$$slope = \frac{(11-10)}{(4-8)} = \frac{1}{-4} = -\frac{1}{4}$$

Line Segment #	Starting Point	Ending Point	rise	run	slope
	(x_1, y_1)	(x_2, y_2)			
1	$(-4, -2)$	$(-4, 4)$			
2	$(0, -4)$	$(0, 3.25)$			
3	$(8, 0)$	$(8, 10)$			
4	$(4, 4)$	$(4, 11)$			
5	$(0, 3.25)$	$(4, 4)$			
6	$(0, 3.25)$	$(-4, 4)$			
7	$(-4, 4)$	$(-0.5, 4.5)$			
8	$(-0.5, 4.5)$	$(-0.5, 10)$			
9	$(-0.5, 10)$	$(4, 11)$			
10	$(8, 10)$	$(4, 11)$			
11	$(-4, -2)$	$(0, -4)$			
12	$(0, -4)$	$(8, 0)$			
13	$(4, 4)$	$(-0.5, 4.5)$			

Fill in the table and calculate the slope of each line.

We say the **slope of a line is undefined** if the line is vertical.

Write undefined in the slope column for all the vertical segments.

We can find the intercept of a line from a point on the line and the slope. Use line segment 10 again

We write $y = mx + b$ The point (x,y) is (8,10) and the slope is $m = \frac{1}{4}$. Plug these into the

equation

Method 2: We can also specify a line segment by giving you a point on the line, the slope of the line and the x values or y values it spans. For example If I said plot the line segment that went through (0,10) had a slope of 5/2 and the x values varied from -4 to 0. You would get the line segment on the graph on page 3. Use the table to fill in the rest of the line segments.

Line	Domain	Slope	Starting point	ending point
1	0 to 0	undefined	(0.0,0.0)	(0.0,2.0)
2	-1 to 0	4	(-1.0,0.0)	
3	-2 to 0	3	(-2.0,0.0)	
4	-3 to 0	8/3	(-3.0,0.0)	
5	-4 to 0	2.5	(-4.0,0.0)	
6	-5 to 0	2.4	(-5.0,0.0)	
7	-6 to 0	8/3	(-6.0,0.0)	
8	-7 to 0	'16/7	(-7.0,0.0)	
9	-8 to 0	2.25	(-8.0,0.0)	
10	-9 to 0	'20/9	(-9.0,0.0)	
11	-10 to 0	2.2	(-10.0,0.0)	
12	0 to 12	-2	(0.0,22.0)	
13			(1.0,20.0)	(10+2/3,-2.0)
14			(2.0,18.0)	(28/3,-2.0)
15	3 to 8	'-18/5	(3.0,16.0)	(8.0,-2.0)
16	4 to 20/3	-6	(4.0,14.0)	
17	5 to 16/3		(5.0,12.0)	(16,-2.0)
18	4 to 6	6	(6.0,10.0)	
19	8/3 to 7		(7.0,8.0)	(8/3,-2.0)
20	4/3 to 8	6/5	(8.0,6.0)	
21	0 to 9	2/3	(9.0,4.0)	
22	10 to -4/3		(10.0,2.0)	(-4/3,-2.0)
23	11 to -8/3		(11.0,0.0)	(-8/3,-2.0)
24	12 to -4	-0	(12.0,-2.0)	
25	0 to -10	-0	(0,0)	
26	12 to -4	-0	(12,-2)	
27	-10 to 10	0	(-10.0,-4.0)	
28	-9.5 to 9.5	0	(-9.5,-5.0)	
29	-9 to 9	0	(-9.0,-6.0)	
30	-8.5 to 8.5	0	(-8.5,-7.0)	
31	-8 to 8	0	(-8.0,-8.0)	

Question 8: What is the domain for line segments 13 and 14?(answer in a complete sentence.)

We can write an equation for a line using only a point and a slope (it is called the point-slope formula)

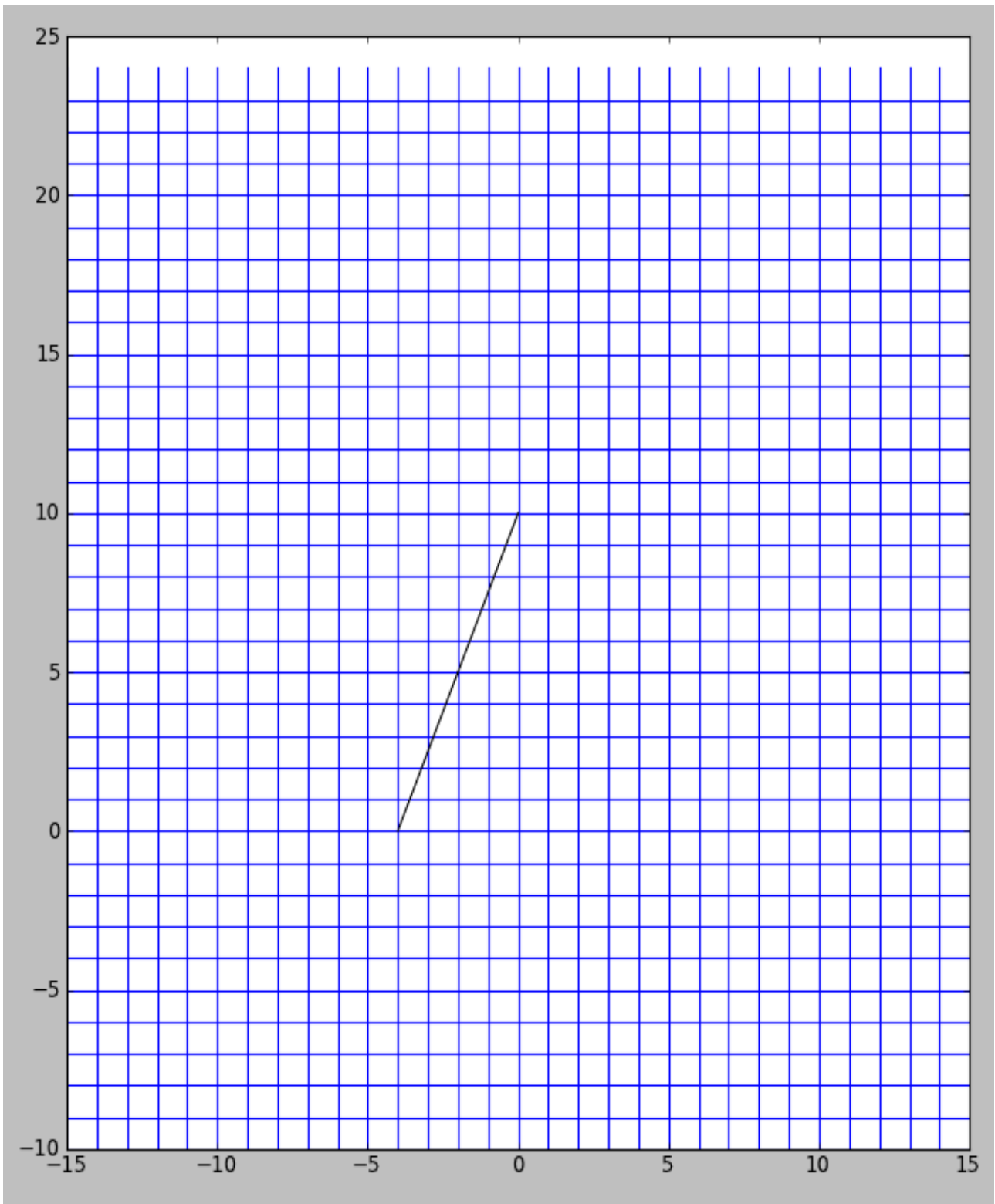
If (x_1, y_1) is a point on the line and the slope is m then the equation is

$$y - y_1 = m(x - x_1)$$

For line 2 the point on the line is $(-1,0)$ and the slope is 4. So the equation is

$$y - 0 = 4(x - (-1))$$

Question 9: What is the point-slope equation for line segment 20?



Question 10: What is the slope-intercept equation for line segment 18?(Hint write the point-slope equation first)