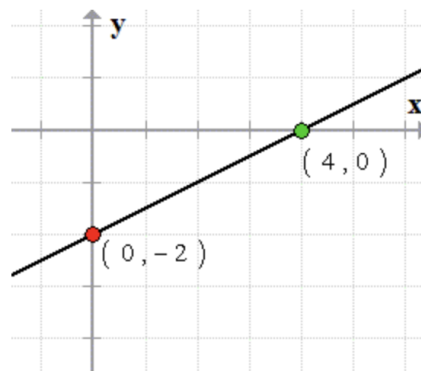


Math 102 Precalculus - Problem Set 1: Lines, Circles, Distance and Midpoint Formula, Functions and Domains

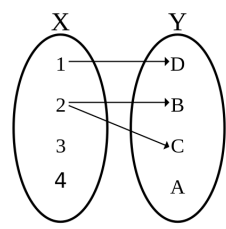
- (1) Consider the points $(-1, 2)$ and $(0, -2)$.
 - (a) Plot and label these points in the x - y plane.
 - (b) Find the slope of the line connecting these points.
 - (c) Write the equation of the line that goes through these points in point-slope form.
 - (d) Write the equation of the line that goes through these points in slope-intercept form.
 - (e) Sketch the line and label the y -intercept.
- (2) Repeat the steps above for the points $(\frac{2}{3}, -1)$ and $(-\frac{1}{3}, -2)$.
- (3) Consider the line $y = -2x + 5$.
 - (a) Determine whether the point $(2, 1)$ lies on the graph of the line. Approach this problem two ways— use the equation and also use your graph by plotting the point.
 - (b) Determine whether the point $(3, -1)$ lies on the graph of the line.
 - (c) Determine whether the point $(3, -2)$ lies on the graph of the line.
- (4) Consider the equation $-3x + 6y - 2 = 0$.
 - (a) Rewrite this equation in slope-intercept form.
 - (b) What is the slope of this line?
 - (c) What is the y -intercept (give as a point)?
 - (d) What is the x -intercept (give as a point)? Hint: to find an x -intercept, set $y = 0$ and solve for x .
 - (e) Sketch the line.
 - (f) What observations can you make about the general form of the equation of a line? For example, what are the powers of x and y terms for equations of lines?
- (5) Consider the following graph. Write the equation of the line in slope-intercept form.



- (6) Consider the line $x = 5$.
 - (a) List any two points which lie on this line.
 - (b) In general, if a point is on this line, what is its x -coordinate?

- (c) What is the slope of this line?
 - (d) We have defined slope to be “rise over run.” For the two points you selected, what is the rise? What is the run?
 - (e) Write a short explanation for why a number divided by zero is undefined. Hint: Feel free to use google. Both Wikipedia and Khan Academy have explanations.
 - (f) Sketch the line.
- (7) Consider the line $y = -\frac{1}{3}x - 1$.
- (a) Write the equation of the line parallel to the given line and passing through the point $(3, 2)$. Give your equation in slope-intercept form.
 - (b) Sketch both lines.
 - (c) What is the only difference between the equations for each line?
- (8) Consider the line $y = 2x - 1$.
- (a) Write the equation of the line perpendicular to the given line and passing through the point $(-2, 1)$. Give your equation in slope-intercept form.
 - (b) Sketch both lines.
 - (c) Where do the lines intersect? Hint: set the equations equal to each other and solve for x . Then use this x value to solve for y .
- (9) Consider a line, $y = 2x + 1$.
- (a) If the line is reflected across the y -axis, find its equation. Sketch both lines. How did the y intercept change with the reflection? How did the slope change with the reflection?
 - (b) If the line is reflected across the x -axis, find its equation. Sketch both lines. How did the y intercept change with the reflection? How did the slope change with the reflection?
 - (c) Can you make any generalizations about a line of the form $y = mx + b$ and the equations of the reflections above? Hint: it might help to do a few more concrete examples.
- (10) A line with slope -3 passes through the points $(-8, p)$ and $(2, 3p)$.
- (a) Find p .
 - (b) Write the equation of this line in slope-intercept form.
 - (c) Sketch this line.
- (11) Graph a family of lines of the form $y = 3x + c$ on the same x - y plane where c is any real number. Describe the pattern of the graph. How does changing c change the graphs of the lines? Hint: choose a few values of c and graph those lines. For example, you might sketch $y = 3x + 1$, $y = 3x + 2$, $y = 3x - 10$.
- (12) Graph a family of lines of the form $y = dx + 1$ on the same x - y plane where d is any real number. Describe the pattern of the graph. How does changing d change the graphs of the lines? Now check your intuition using this Desmos application which has a slider for the parameters m and b for lines of the form $y = mx + b$: <https://www.desmos.com/calculator/wuxkicjcre>
- (13) Consider the points $(2, 3)$ and $(0, 6)$.
- (a) Plot and label these points in the x - y plane.
 - (b) Find the slope of the line connecting these points.

- (c) Find the distance between the points.
- (d) Find the midpoint of the line segment connecting these points. Label the midpoint on your sketch.
- (14) Find a point of the form $(2a, a)$ in the third quadrant such that the distance from this point to $(1, 3)$ is 5. Hint: You might start by writing the distance formula for the two points and setting it equal to 5.
- (15) Consider the circle with equation $x^2 + y^2 + 8x - 6y + 16 = 0$.
- Complete the square to put this equation in standard form $((x - h)^2 + (y - k)^2 = r^2)$.
 - What is the center?
 - What is the radius?
 - Sketch the circle.
 - Is this a function?
- (16) Consider the following mapping. Is it a function? Why or why not?



- (17) Let $f(x) = 8 - x^2$. Fill out the following table by evaluating the function.

x	$f(x)$
-2	
-1	
0	
1	
2	
<i>apple</i>	
$2 + h$	

- (18) Consider $f(x) = 2x + 1$.

- (a) Fill out the following table (I did the first row as an example):

x	$f(x)$	$f(x + 2)$	$f(x) + 3$
1	$2(1) + 1 = 3$	$2(1 + 2) + 1 = 7$	$2(1) + 1 + 3 = 6$
2			
3			
4			

- (b) Sketch $f(x)$. Label the four points in your table on the graph.
- (c) Sketch $f(x + 2)$. Label the four points in your table on the graph. How does this sketch relate to the sketch of $f(x)$?

- (d) Sketch $f(x) + 3$. Label the four points in your table on the graph. How does this sketch relate to the sketch of $f(x)$?
- (e) Can you make a guess about how the addition of constants inside and outside the function alters the graph? For example, $f(x + a)$ does what to a graph? And $f(x) + b$ does what?
- (19) Sketch the domain of each function on the real number line. Give the domain in **interval notation** of the following functions.
- (a) $f(x) = \sqrt{x - 7}$
- (b) $f(x) = \frac{1}{x-4}$
- (c) $f(x) = \frac{2x-3}{3x+5}$
- (d) $f(x) = \sqrt{x - 5} + \frac{x+1}{x-10}$ Hint: you might consider the domain of each term separately, then look for the intersection.
- (20) REFLECTION AND CONSOLIDATION (Hint: this will form part of a study guide for your first exam!)
- (a) Summarize the main ideas/formulas you used for this problem set. You can list formulas, bullet-out phrases, write a paragraph, draw sketches, or answer this question in any way that makes sense to you.
- (b) What three problems were the most challenging for you? After deciding, look at your solutions carefully, and write a short explanation of what you found challenging and how you overcame this challenge in your problem solving. For example, did you find a simpler problem about the same topic? Did you guess and check? Did you graph with technology?
- (c) Write three potential test questions on the topics covered in this problem set.