Functions

You should have already watched a video or heard from your instructor about functions – what they are, how to think of them, some examples. We want to make sure we're all on the same page as far as notation and terminology goes, so that when we talk about them, there's no confusion.

1. If we define a function as, say, $f(x) = x^2 + 3$, then:

    (a) The name of the function is _____.

    (b) The independent variable is _____.

    (c) The output of the function is denoted by _____.

2. We often write $y = f(x)$. In this case, we could call y the _____.

3. When graphing a function, we typically let the horizontal axis represent the _____ variable and the vertical axis represent the _____ variable.

4. True or False? A formula for a function is always better than a graph for a function. Explain.

5. Why is a circle not a function?

6. Let $f(x) = |x^2 - 3|$.

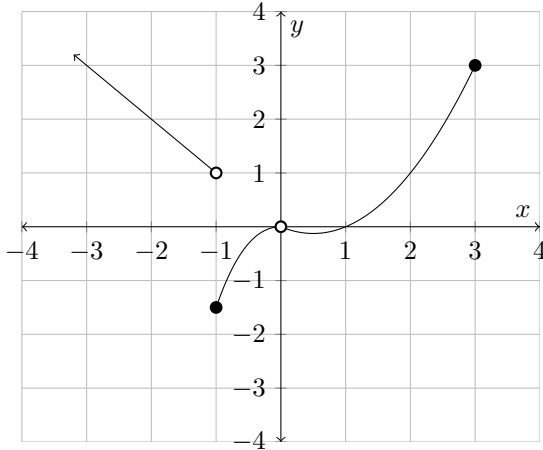   (a) Complete the missing entries in the table below. The top row should be in ascending order.

x	-2	-1		1		4	10
$f(x)$			3		6		

    (b) What is the implied domain of f?

    (c) Which of the following points are on the graph of f? Circle all that apply.

$$(0,0) \qquad (-1,2) \qquad (-3,0) \qquad (\sqrt{3},0) \qquad (1,-2) \qquad (1,2)$$

7. Let the function g be given by the following graph:

(a) What is the domain of g?

(b) What is the range of g?

(c) Fill in the following table as much as you can. If a value is undefined or does not exist or there's some other problem, explain.

x	-2	-1	0	1			
$f(x)$					1	0	3

(d) Rank these values in order from smallest to largest: $g(-2), 3, g(1), g(-1), 0, g(3)$.

(e) Which of these statements is true about the function g?

1. The function g is defined for all real numbers.
2. The equation $g(x) = 0$ has no solutions.
3. For all $x > 0$, $g(x) < 4$.
4. For all $x < 0$, $g(x) < h(x)$, where $h(x) = -4x + 2$.
5. $g(x)$ is always positive.

8. Explain what the vertical line test is and why it works.

9. When we're trying to find the implied domain of a function, what can cause a value to *not* be in the domain of a function?

10. What is the implied domain of $\frac{2x}{\sqrt{1-3x}}$?

11. Puzzle question: add two lines to this function to make it so the implied domain is $(-\infty, \infty)$.

$$f(x) = \sqrt{x-8}$$

12. If you have a function f, is it true that $f(a+b) = f(a) + f(b)$? Try some examples to check.

13. If you have a function f is it true that $f(3a) = 3f(a)$? Try some examples to check.

14. If you have a function f is it true that $f(a^2) = f(a)^2$? Try some examples to check.