- *Functions*

1. **Definition.** A **set** is a collection of objects. A **function** is a correspondence between a first set, called the **domain**, and a second set, called the **range**, such that each member of the domain corresponds to *exactly one* member of the range.

2. Determine whether each correspondence is a function.

   (a)

Domain	-3	-1	2	6	7
Range	2	1	-3	-1	-4

   (b) Domain: A set of iPhones
   Correspondence: Each iPhone's serial number
   Range: A set of alphanumeric codes

   (c) Domain: The set of all 50 states
   Correspondence: Each state's U.S. Senators
   Range: The set of all 100 U.S. Senators

   (d) Domain: The set of all real numbers
   Correspondence: Each number's fourth power
   Range: The set of all nonnegative numbers

3. A function f is given by $f(x) = 2x^2 - 4x + 3$. Find $f(-2)$, $f(3)$, $f(\sqrt{t})$, $f(2x)$, $f(x+1)$, and $\dfrac{f(x+h) - f(x)}{h}$.

4. A function f is given by

$$f(x) = \begin{cases} x^3 - 1, & \text{when } x < -1, \\ 2 - x, & \text{when } -1 \leq x < 3, \\ 4, & \text{when } x \geq 3. \end{cases}$$

   Find $f(-2)$, $f(-1)$, $f(0)$, $f(3)$, and $f(5)$.

5. **Definition.** The **graph** of a function f is a drawing that represents all the input-output pairs $(x, f(x))$. In cases where the function is given by an equation, the graph of the function is the graph of the equation $y = f(x)$.

6. Graph the functions.

   (a)

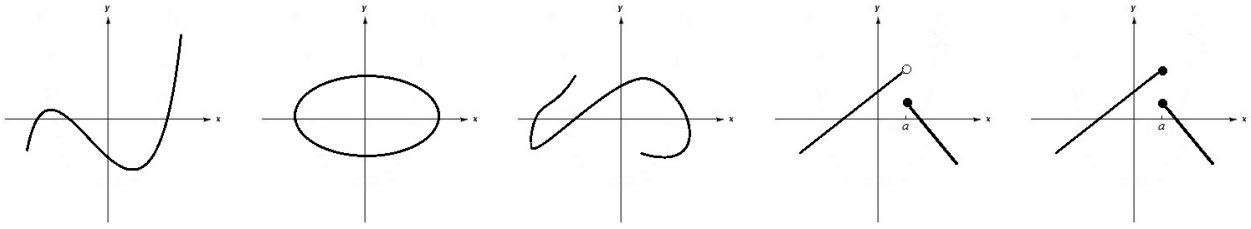
x	-2	-1	0	1	2
$f(x)$	3	-1	2	0	-1

   (b) $f(x) = 4 - x^2$

(c) $f(x) = \begin{cases} x - 1, & \text{when } x < 2, \\ -1, & \text{when } x \geq 2. \end{cases}$

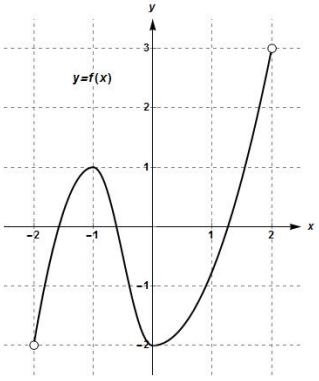
7. **The Vertical-Line Test.** *A graph represents a function if it is impossible to draw a vertical line that intersects the graph more than once.*

8. Determine whether each graph is that of a function.

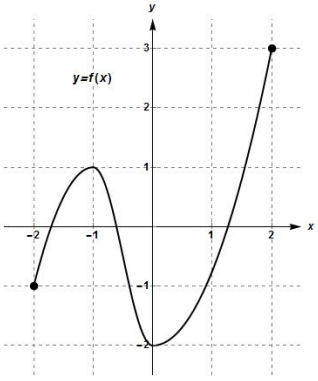


(a) (b) (c) (d) (e)

9. Answer the questions for each function below.



(i)



(ii)

(a) Find the domain and the range.

(b) Find $f(-1)$ and $f(0)$.

(c) How many x-values are there such that $f(x) = -1.5$?

10. Find the domain of the functions.

(a) $f(x) = x^5 - 3x + 1$

(b) $f(x) = \dfrac{3x^4}{3x + 2}$

(c) $f(x) = \sqrt{2 - 4x}$

(d) $f(x) = |x + 6|$