

I. What is a function?

A. A **relation** is any set of ordered pairs. A **function** is a special kind of relation where each x-value is associated with exactly one y-value. For every input there is exactly one output.

B. Determine whether each equation is a function.

1. $y = \frac{1}{2}x - 3$

2. $x = y^2 - 1$

C. For the given function evaluate $f(x) = 2x^2 - 3x$ for:

3. $f(3)$

4. $f(x) + f(3)$

5. $3f(x)$

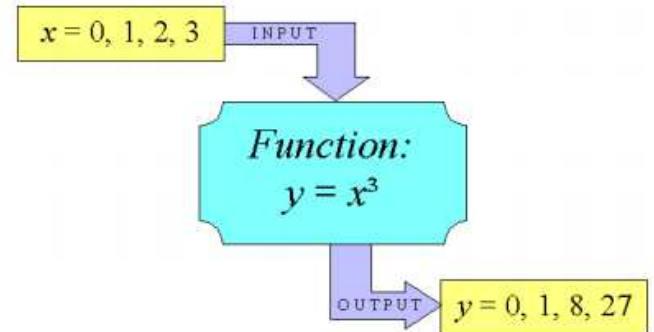
6. $f(-x)$

7. $-f(x)$

8. $f(3x)$

9. $f(x + 3)$

10. $\frac{f(x+h) - f(x)}{h}$



II. Domain

A. Constraints

- denominator cannot equal 0
- anything under a square root must be greater than or equal to 0
- if no domain is specified, then the domain will be taken to be the largest set of real numbers for which the equation defines a real number

B. Find the domain, use interval notation.

11. $f(x) = \frac{x+4}{x^2 - 2x - 3}$

12. $g(x) = x^2 - 9$

13. $h(x) = \sqrt{3 - 2x}$

C. If we have two functions, we can use different techniques to combine them into one.

$f + g$	$(f + g)(x) = f(x) + g(x)$	Domain: $f \cap g$
$f - g$	$(f - g)(x) = f(x) - g(x)$	Domain: $f \cap g$
$f \cdot g$	$(f \cdot g)(x) = f(x) \cdot g(x)$	Domain: $f \cap g$
$\frac{f}{g}$	$\left(\frac{f}{g}\right)(x) = f(x) \cdot g(x)$	Domain: $\{x \mid g(x) \neq 0\}, \cap$ domain of $f \cap$ domain of g

D. Combinations of functions and their domains.

Let $f(x) = 2x^2 + 3$ and $g(x) = 4x^3 + 1$. Find the functions and determine their domains.

14. $(f + g)(x)$

15. $(f - g)(x)$

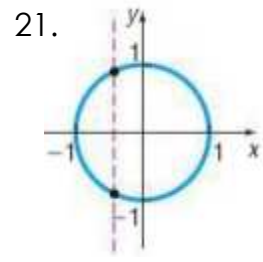
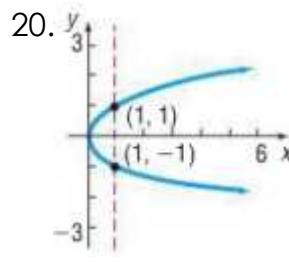
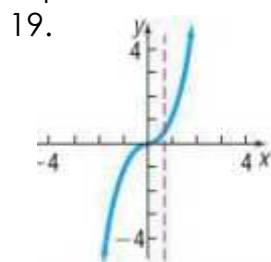
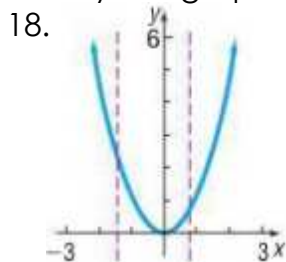
16. $(f \cdot g)(x)$

17. $\left(\frac{f}{g}\right)(x)$

III. Graphs of Functions

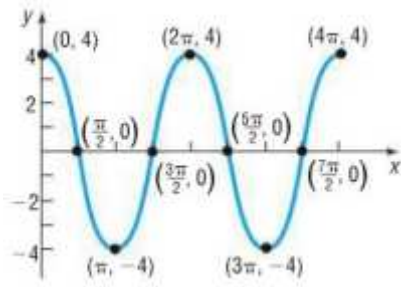
A. **Vertical Line Test** – the graph of a function cannot contain two points with the same x-coordinate and different y-coordinate.

Identify the graphs that represent a function and the domains for all.



B. Obtaining information from the graph of a function

22.



a) What are $f(0)$, $f(3\pi/2)$, and $f(3\pi)$?

b) What is the domain of f ?

c) What is the range of f ?

d) List the intercepts.

e) How many times does the line $y = 2$ intersect the graph?

f) For what values of x does $f(x) = -4$?

g) For what values of x is $f(x) > 0$?

C. Obtaining Information about the graph of a function

23. Consider the function: $f(x) = \frac{x+1}{x+2}$

a) Find the domain of f .

b) Is the point $(1, \frac{1}{2})$ on the graph of f ?

c) If $x = 2$, what is $f(x)$? What point is on the graph of f ?

D. Average Cost Function

24. The average cost \bar{C} of manufacturing x computer per day is given by the function

$$\bar{C}(x) = 0.56x^2 - 34.39x + 1212.57 + \frac{20000}{x}$$

a) Determine the cost of manufacturing 30 computers in a day

b) 40 computers

c) 50 computers

d) Graph the function $\bar{C} = \bar{C}(x)$, $0 < x \leq 80$

e) Which value of x minimizes the average cost?