AP Calculus AB

1.1_WS_Domain_Range_B

Given a function $y = f(x)$, the **Domain** of the function is the set of inputs and the **Range** is the set of resulting outputs.
Domains can be found algebraically; ranges are often found algebraically and graphically. Domains and Ranges are sets. Therefore, you must use proper set notation.

Algebraic method:

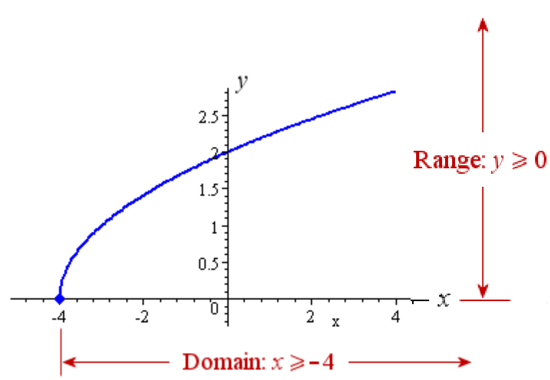
When finding the domain of a function, ask yourself **what values can't be used**. Your domain is everything else. There are simple basic rules to consider:

- The domain of all polynomial functions is the Real numbers **R**.
  $f(x) = x^3 - 6x^2 + 5x - 11)$
  Since $f(x)$ is a polynomial, the domain of $f(x)$ is **R**. It can also be written $(-\infty, \infty)$
- Square root functions can not contain a negative underneath the radical. Set the expression under the radical greater than or equal to zero and solve for the variable. This will be your domain.
  $g(t) = \sqrt{2 - 3t}$
  Since $g(t)$ is a square root, set the expression under the radical to greater than or equal to zero: $2 - 3t \geq 0 \rightarrow 2 \geq 3t \rightarrow 2/3 \geq t$. Therefore, the domain of $g(t)$ = (- infinity, 2/3]
- Rational functions can not have zeros in the denominator. Determine which values of the input cause the denominator to equal zero, and set your domain to be everything else.
  $h(p) = \dfrac{p-1}{p^2 - 4}$
- Since $h(p)$ is a rational function, the denominator can not equal zero. Set $p^2 - 4 = 0$ and solve: $p^2 - 4 = 0 \rightarrow (p + 2)(p - 2) = 0 \rightarrow p = -2$ or $p = 2$. These two p values need to be avoided, so the domain of $h(p)$ = **R** $-\{ -2$ or $2 \}$ or $(-\infty,-2)\cup(-2,2)\cup(2,\infty)$
  The – minus is read as "except".

Graphical method:

Function $y = \sqrt{(x + 4)}$ has the following graph
The **domain** of the function is $x \geq -4$, since x cannot take values less than -4.

D:[-4, ∞)



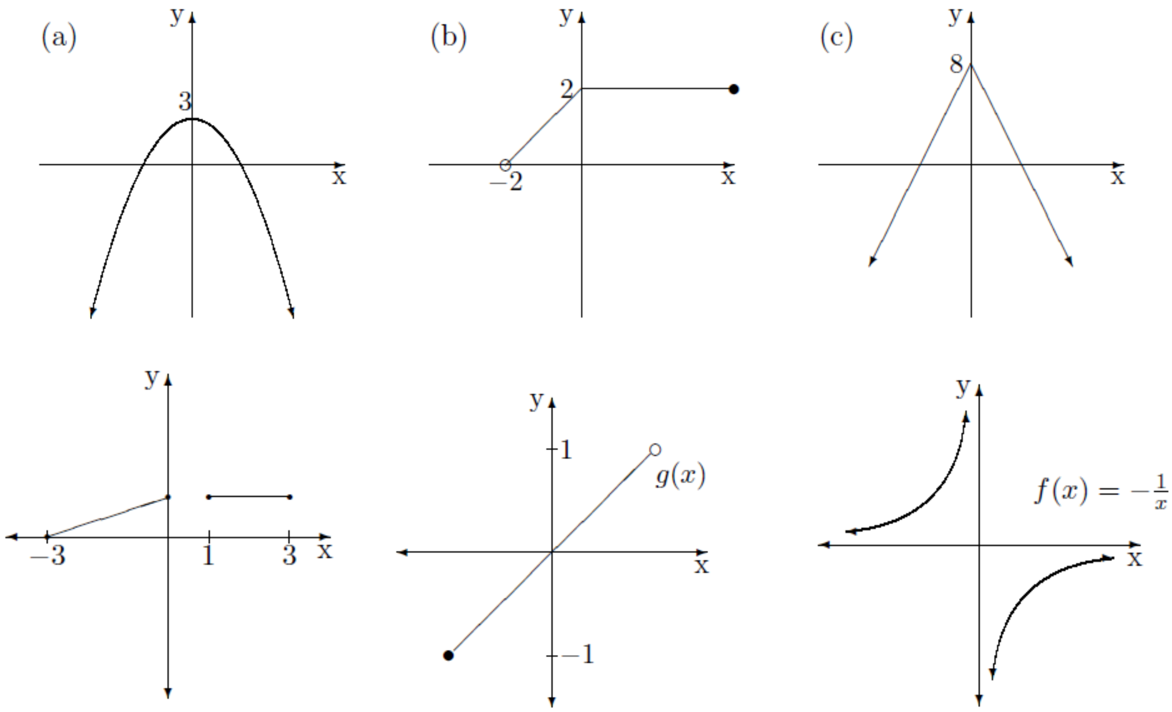
The **range** of a function is the possible ***y*** values of a function that result when we substitute all the possible x-values into the function.
Make sure you look for **minimum** and **maximum** values of ***y.***
We say that the **range** for this function is $y \geq 0$
or R:[0, ∞)

Exercises: 1.1

I. Algebraically determine the following domains. Use correct set notation.

1. $d(y) = y + 3$	2. $g(k) = 2k^2 + 4k - 6$	3. $b(n) = \sqrt{2n-8}$
4. $m(t) = \sqrt{9-3t}$	5. $u(x) = \dfrac{x-5}{2x+4}$	6. $a(r) = r + \dfrac{1}{r-1}$
7. $q(w) = \dfrac{w+4}{w^2+1}$	8.* $f(x) = \dfrac{x}{\sqrt{x+3}}$	9.* $t(v) = \sqrt{v^2+2v-8}$

II. Find the domain and range of the following functions from the graph. Use correct set notation



III. A marathon race was completed by 5 participants. What is the range of times given in hours below?

2.7 hr, 8.3 hr, 3.5 hr, 5.1 hr, 4.9 hr

IV. Find the domain

a) $f(x) = \dfrac{x+3}{\sqrt{x-8}}$ b)g(y) = $\sqrt{3y-54}$ c) $y = \dfrac{x+1}{5x+7}$