GRADE : X
SUBJECT: Opt. Maths

CHILDREN'S HAVEN
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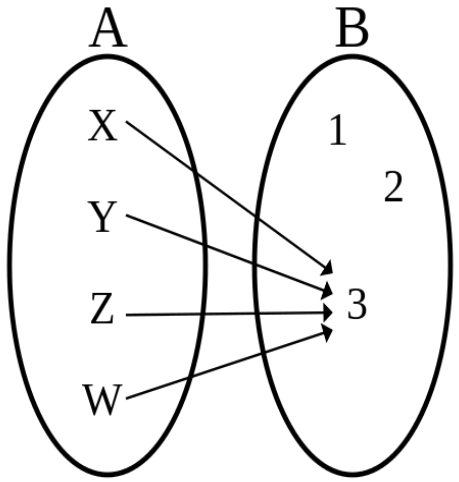
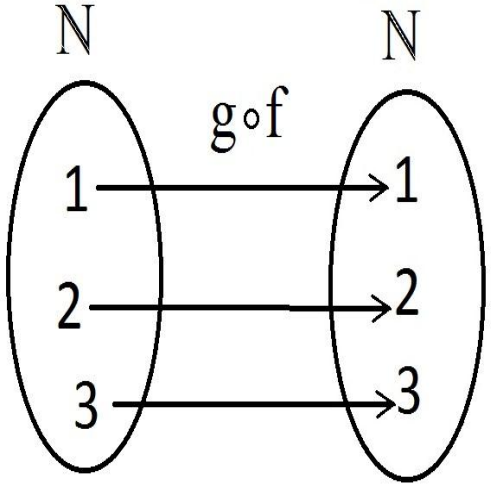
Functions:

- Constant function
- Identity function
- Trigonometric function
- Composite function
- Inverse function



Constant function

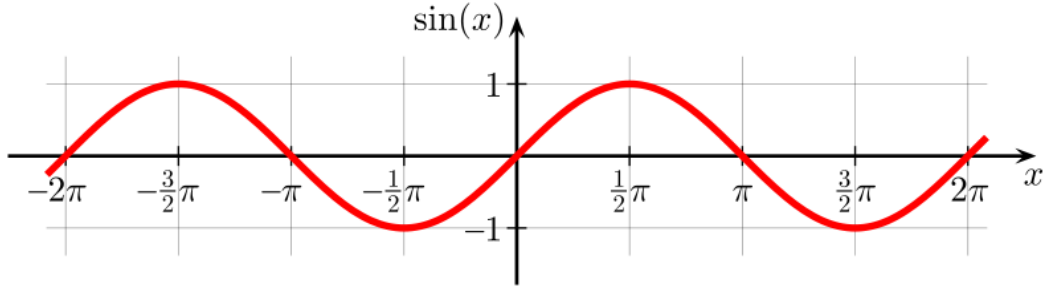


Identity function

Trigonometric function

- The function taking trigonometric ratio as an independent variable is called trigonometric function.

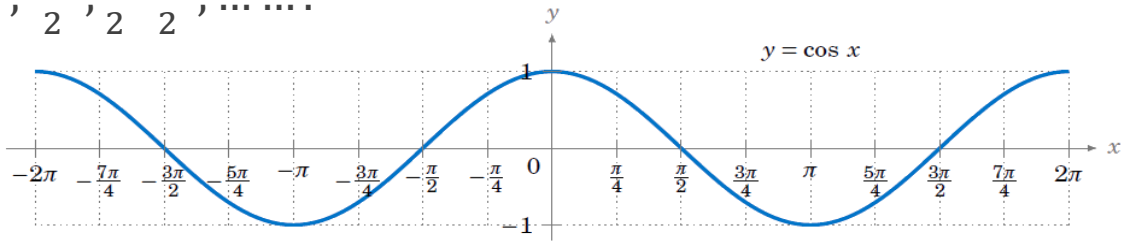
Sine functions:



- The y-intercept of sinx is 0.
- The x-intercepts are ….-2π, −π, 0, π, 2π, … …
- The domain is $(-\infty, +\infty)$.
- The range is [-1,1].

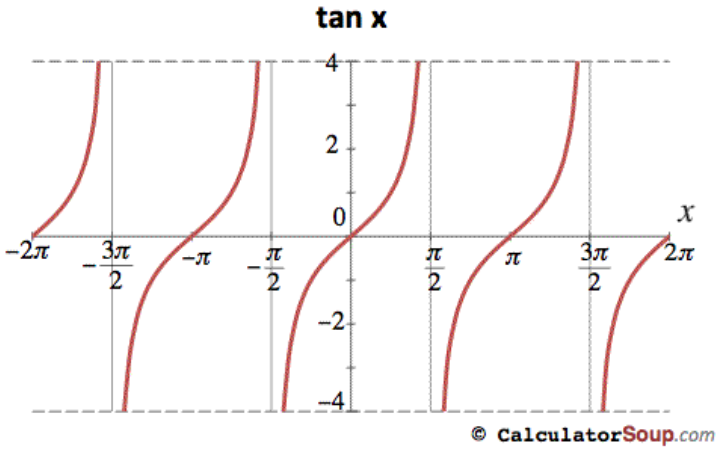
Cosine functions:

- The y-intercept is 1.
- The x – intercepts are …..$\frac{-3\pi}{2}, \frac{-\pi}{2}, \frac{\pi}{2}, \frac{3\pi}{2}$, … ….
- The domain is $(-\infty, +\infty)$.
- The range is [-1, 1].



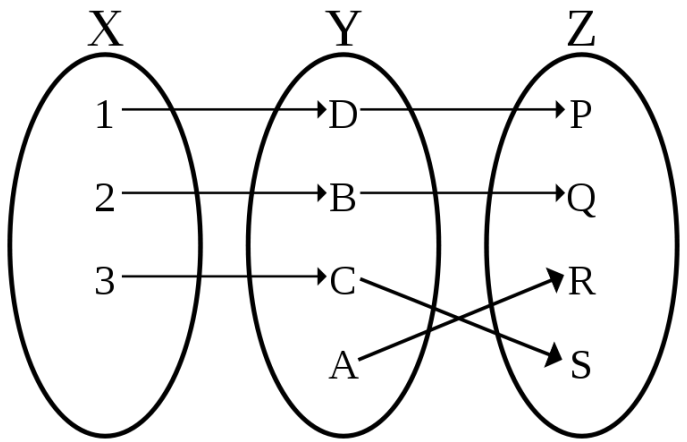
Tangent functions:

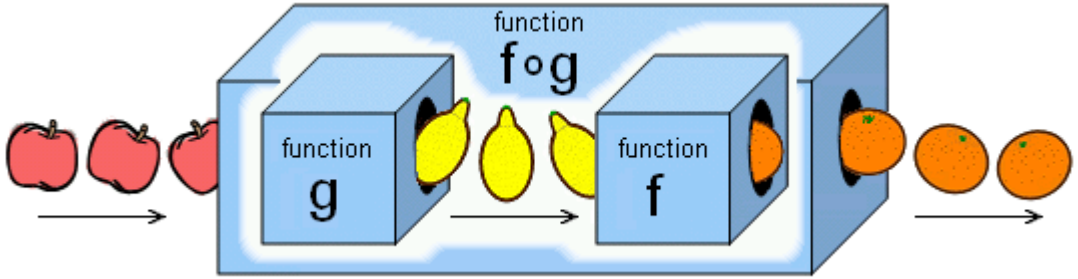
- The y-intercept is 0.
- The x-intercepts are ….-2π, −π, 0, π, 2π,..
- The domain is $(-\infty, +\infty)$ excluding $\frac{\pi}{2} + n\pi$.
- The range is $(-\infty, +\infty)$.



Composite function

- Let g:X→ Y and f:Y⟶Z are two functions. A function from X to Z is called composite function if it maps every element of X to unique elements of Z.





Composite function

Worked Out Example: 1

- If $f(x) = 3x + 4$ and $g(x) = 2x - 5$, find $fog(x)$ and $gof(x)$.

Solution: $f(x) = 3x + 4$ and $g(x) = 2x - 5$

$fog(x) = f(g(x))$

$= f(2x - 5)$

$= 3(2x - 5) + 4$

$= 6x - 15 + 4$

$= 6x - 11$

$gof(x) = g(f(x))$

$= g(3x + 4)$

$= 2(3x + 4) - 5$

$= 6x + 8 - 5$

$= 6x + 3$

Hence, $fog(x) \neq gof(x)$

Worked Out Example: 2

- f f(x) = 2x + 3 and fog(x) = 4x + 5, find g(x).

  Hint: Start from f(x).

  f(x) = 2x + 3,

  or, f(g(x)) = 2g(x) + 3,

  or, 4x + 5 = 2g(x) + 3,

  on simplifying, g(x) = 2x + 1

- If g(x) = 3x – 4 and fog(x) = 6x + 5, find f(x).

  Hint: start from fog(x).

  fog(x) = 6x + 5

  or, f(g(x)) = 6x + 5

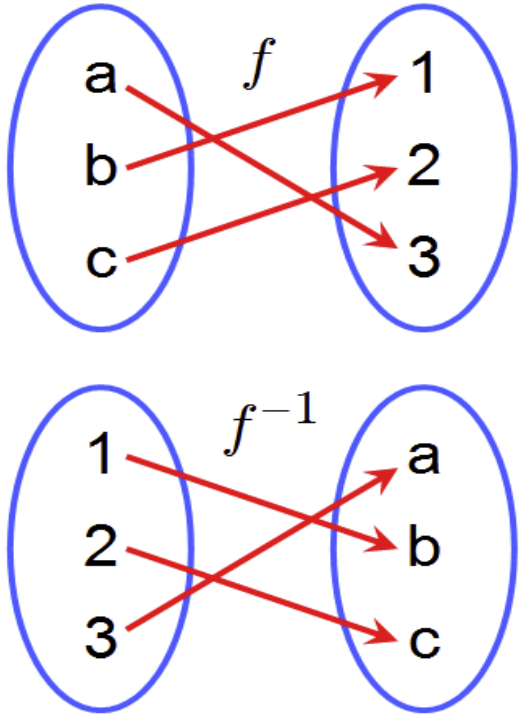
  or, f(3x – 4) = 6x + 5

  or, f(3x – 4) = 2(3x – 4) + 5 + 8

  or, f(x) = 2x + 13

Inverse function

- Let f:A→ **B** be an one-to-one onto function. A new function from B to A is the inverse function of the given function.



Inverse function

Worked Out Example: 1

- Find the inverse of the function f(x) = 3x + 5.

Solution:

Let y = f(x) = 3x + 5

or, y = 3x + 5

Interchanging x and y, we get,

x = 3y + 5

Solve to get the value of y

or, x – 5 = 3y

or, 3y = x – 5

or, $y = \frac{x-5}{3}$

This is the inverse of the given function.

Worked Out Example: 2

- Find the inverse of f(x) = $\frac{2x+3}{5x-4}$
- let y = f(x) = $\frac{2x+3}{5x-4}$
- y = $\frac{2x+3}{5x-4}$
- Interchanging the values of x and y.
- x = $\frac{2y+3}{5y-4}$
- Solve in such a way that only one y is there and keep in LHS.
- 5xy – 4x = 2y + 3
- 5xy – 2y = 4x + 3
- y(5x – 2) = 4x + 3
- So, y = $f^{-1}(x)$ = $\frac{4x+3}{5x-2}$
- Hence the inverse of $\frac{ax+b}{cx+d}$ **is** $\frac{-dx+b}{cx-a}$

Exercise:

1) Define trigonometric function.
2) What is the y-intercept of y = sinx?
3) Write the domain of y = tanx.
4) What is the range of y = cosx?
5) Define composite function with example.
6) If f(x) = 2x + 7 and g(x) = 5x – 3, find fog(x) and gof(x).
7) If f(x) = 3x – 4 and g(x) = x^2, find fog(x) and gof(x).
8) If f(x) = 2x – 5 and fog(x) = 8x + 5, find g(x).
9) If g(x) = 3x – 2 and fog(x) = 6x + 4, find f(x).
10) Define inverse function.
11) Find the inverse of the given functions:

a) f(x) = 2x + 7 b) f(x) = 7x – 3

c) f(x) = $\frac{3x-5}{4x+2}$ d) g(x) = $\frac{5x-3}{2x+7}$

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