

# [Research paper on functions](https://assignbuster.com/research-paper-on-functions/)

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## QUESTION I

Function
This is an equation or expression that shows the relationship between input and output variables. It transforms each input value into one output value. For instance, a function f(x) = 3x multiplies each input value by three to give the output value

## Domain

Set of all possible input values. For instance, the domain of f(x) = 1/x is any real number apart from zero

## Range

Set of all possible output values. For instance the range of f(x) = Sin x is -1, +1.

## Linear Function

Also known as first degree function
Maximum power of input variable is 1
Written in the form of f(x) = ax +b
Example f(x) = 3x + 4

## Quadratic Function

Also known as second degree polynomial
Maximum power of input variable is 1
Written in the form of f(x) = a x2 + b x + c
Example f(x) = 5x2+10x +1

## Third Degree Polynomial Function

Also known as cubic function
Maximum power of input variable is 3
Example f(x) = 2x3

## Exponential Function

The input variable is the power
Written in form of f(x) = b x
Example f(x) = e x

## Logarithmic Function

Written in the form f (x) = log a x
The above equation is the inverse of f(x) = ax
Example of logarithmic function is f(x) = log2 4

## Periodic Function

Input and output variables repeat themselves after specific interval
Good example is trigonometric function
Example f (x) = Sin x repeat itself after 2π

## QUESTION 2

- Simple Pendulum Displaced at a Small Angle
A simple pendulum displaced at a small angle ϴ swings back and forth. This motion can be described as periodic because it repeats itself after a specific interval of time called period. The period of pendulum can be derived from known quantities. T = T= 2πl/g. This implies that the period depends on the length of the string and the gravity
Two variables can be used to show that the motion of simple pendulum is periodic. These are displacement (dependent) and time (independent). The displacement is measured in terms of the angle. The displacement equation is given by ϴ = ϴ0 Cos (wt + ψ) where w = l/g which is equal to the angular frequency of the pendulum. ϴ0 is the maximum displacement. The following shows a sketch of graph of 0 = ϴ0 Cos wt for ψ = 0.
The data can be gathered by displacing the pendulum at different angles and finding the periodic time. A pendulum of length 100cm was used. The following table shows the results.

## QUESTION 3

Amplitude
For sine and cosine functions, the amplitude is half the maximum height of the graph/wave
It is absolute peak value of a sinusoidal wave
Period
For sine and cosine functions, the period is the length of the interval at which the wave repeats itself
The sine and cosine wave repeats them after 2π. Therefore, their period is 2π
Frequency
For sine and cosine functions, the frequency is the number of waves completed in a specific interval. Determined by getting the reciprocal of period

## Average Value of a periodic Function

Is given by F=
Considering a sinusoidal function of general form f(x) = A (Sin b x + d)

## The amplitude is given by A

Period is given by 2π/b where b is absolute value
Frequency is given by b/2π
For example a sinusoidal function f(x) = 3 Cos (-2x + 3) has an amplitude of 3, period of π and frequency of 1/π

## QUESTION 4

The inverse of a periodic function such as sinusoidal functions are determined by limiting the domain to 0 ≤ x ≤ π. Thus the inverse is defined in terms of restricted function.

## The following shows the graphs of inverse of sine and cosine functions

Inverse of cosine function
Inverse of a sine function
The inverse of sine and cosine functions are a reflection of their corresponding functions on y= x

## QUESTION 5

Research the invention and use of the Richter Scale
Richter scale was developed by Charles Richter in 1935 (Krebs, 2003)
It measures the magnitude of earthquake in terms of intensity/amplitude
The magnitude of earthquake correspond to the energy released when earthquake occurs
The scale collects information about the earthquake using seismograph
It is based on logarithmic scale meaning that increase meaning each level is tenfold greater than previous one
There are 8 levels
For every one whole number increase in magnitude, the energy increases by 31. 7 times.

## The higher the magnitude of the earthquake as measured by Richter scale, the greater the magnitude of ground movements

Research two past earthquakes
Chile Earthquake
Saturday, February 27, 2010
Off Coast in Central Chile
Epicenter
210 miles south west of Santiago

## Richter scale

8. 8

## Mercalli scale

VIII
Haiti Earthquake
Tuesday, January 12, 2010
Areas around Haitian capital city Port-au-Prince
Epicenter
10 miles southwest of Port-au-Prince

## Richter scale

7. 0

## Mercalli scale

X

## Computation and Comparison of Earthquakes

Magnitude of earthquake on Richter scale is given by
M = log I/S
Where I is the intensity of earthquake measured and S is standard Intensity of earthquake = 10-4 cm
10M = Ia/S
10Ma = Ia/S
10Mb = Ib/S
S = Ia/10Ma
S = Ib/10Mb
Ia/10 Ma = Ib/10Mb
The intensity of more intense earthquake is equals the intensity of a less intense earthquake multiplied by the ratio of the magnitude of the more intense earthquake to magnitude of less intense earthquake

## Defining e

It can be defined from Taylor Series
ex =
Where x = 1
1 = 1+1/1
= 2. 0
2 = 1/1x2
= 0. 5
3= 1/1x2x3
0. 167
4= 1/1x2x3x4
0. 04167
2. 70867

## References

Krebs, R. E. (2003). The basics of earth science. Westport, Conn: Greenwood Press.
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