Research paper on functions

Environment, Disaster



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 $f(x) = a x^2 + b x + c$

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) = axExample 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= 2 π l/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 $\Theta = \Theta 0 \text{ Cos } (\text{wt} + \psi)$ where w = I/g which is equal to the angular frequency of the pendulum. $\Theta 0$ is the maximum displacement. The following shows a sketch of graph of $0 = \Theta 0 \text{ Cos } \text{wt}$ for $\psi = 0$. 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

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

The amplitude is given by A

Period is given by $2\pi/b$ where b is absolute value

Frequency is given by $b/2\pi$

For example a sinusoidal function $f(x) = 3 \cos(-2x + 3)$ has an amplitude of

3, period of π and frequency of $1/\pi$

QUESTION 4

The inverse of a periodic function such as sinusoidal functions are determined by limiting the domain to $0 \le x \le \pi$. 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

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corresponding functions on y = x
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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

Х

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 0.041672.70867

References

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

Magnitude 7. 0 - Haiti Region. (n. d.). Magnitude 7. 0 - Haiti Region.

Retrieved December 4, 2013, from http://earthquake. usgs.

gov/earthquakes/eqinthenews/2010/us2010rja6/

Magnitude 8. 8 - Off-Shore-Bio , Chile. (n, d.). Magnitude 8. 8 - Offshore Bio-

Bio, Chile. Retrieved December 6, 2013, From Http://Earthquake. Usgs.

Gov/Earthquakes/Eqinthenews/2010/Us2010tfan/