Introduction to math, number, function, logic, sets

Math is a method of science.

Math is in food science, agribusiness, teleportation, quantum computers, almost everywhere.

Math is a method of science.

Detailed explanation of math:

biomath.weebly.com

statistics4students.weebly.com

discrete4math.weebly.com

discrete7math.weebly.com

calculus12s.weebly.com

calculus17.weebly.com

calculus1only.weebly.com

calculus2only.weebly.com

algebra4students.weebly.com

Question:

What is math?

Question:

What do you want from this math course?

Scholarship

Exchange students

American citizenship

Accessing all information you need

Question:

Would you like to be exchange students, study and work in the USA, Canada, Europe, Australia?

Project

Try to do your project on any topic you like or interested in.

You may present your project to the audience.

Bernoulli experiment

Question:

Explain Bernoulli experiment.

Question:

Calculate the best country.

Number theory

Natural, integer, rational, irrational, real, complex numbers.

Prime numbers are the building blocks of all the other numbers, just like chemical elements are the building blocks of all the substances.

Question:

Give examples of natural, integer, rational, irrational, real, complex numbers.

Number puzzle game

Question:

Solve number puzzle for 3 + m4 digits.

m4 = s mod 4

s is your student number

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/code1-4numberpuzzles.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/code1-5numberpuzzles.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/code1-6numberpuzzles.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/code0-6numberpuzzles.txt

https://discrete4math.weebly.com/uploads/2/5/3/9/25393482/code1-8numberpuzzles.txt

Question:

Find approximation of e number.

Calculate (1+1/T)T.

s = 19107016

T = s Mod 100

MsgBox (1 + 1 / T) ^ T

https://calculus17.weebly.com/uploads/7/7/9/0/77906190/e\_approximation2019oct.txt

Functions theory

Linear, exponential, logarithmic functions

Exponential growth and decay

There are elementary, algebraic, special functions.

Even and odd functions

Even function: f(x) = f(-x)

Odd function: f(x) = - f(-x)

Composite function: f(g(x))

Inverse function f-1(x), f-1(f(x)) = f (f-1(x)) = x

Here are examples of functions, for which inverse functions are the same:

y = x

y = 1 – x

y = 1/x

Question:

What are the main functions?

Question:

Find inverse functions, which are the same as the original functions.

Logic

Truth tables of NOT, AND, OR

Arithmetic equivalents

NOT A = A + (-1)A

A AND B = AB

A OR B = A + B - AB

Question:

Give truth tables of NOT, AND, OR and their arithmetic equivalents.

Implication

If I study hard then I will be rich. Analyse this implication.

Boolean algebra

Writing formula of Boolean function based on its truth table.

Question:

Give expression of implication through NOT, AND, OR and their arithmetic equivalents.

Proof

Nothing can be proved perfectly; this is used a lot in real life.

There are different kinds of proof.

Question:

Prove by induction.

Prove .

Probability:

Averages

Mean, median and mode

Binomial distribution

Sets

Set is a collection of some elements. Order does NOT matter.

Repetition of the same element counts as one element.

Since order does NOT matter, the total number of subsets of a set is sum of all the combinations, which means 2T, where T is the number of elements (cardinality) of the set.

Question:

How many subsets are there in a set of T elements?

Limit

Question:

Illustrate definition of limit using ε – δ language.

. f(x) = Tx + k. For any ε find δ, using ε – δ definition of the limit.

Question:

m2 = 0: When does limit exist?

https://brilliant.org/wiki/when-does-a-limit-exist/

https://en.wikipedia.org/wiki/Limit\_of\_a\_function

m2 = 1: List indeterminate forms.

https://en.wikipedia.org/wiki/Indeterminate\_form

Question:

Give L’Hopital rule.

https://en.wikipedia.org/wiki/L%27H%C3%B4pital%27s\_rule#targetText=In%20mathematics%2C%20more%20specifically%20calculus,be%20easily%20evaluated%20by%20substitution.

m4 = 0: Use L’Hopital rule to prove First Great Limit of Calculus:

m4 = 1:

m4 = 2:

m4 = 3:

**Continuity:**

Question:

Investigate continuity of the function:

m7 = 0: x

m7 = 1:

m7 = 2:

m7 = 3:

m7 = 4:

m7 = 5:

m7 = 6:

Derivative

Question:

What is derivative?

Question:

m2 = 1: Give the properties of derivative: times constant, sum, product, quotient.

Question:

m2 = 0: Prove expression for derivative of x2 using limit.

Question:

Find derivatives of these functions:

m4 = 0: ex

m4 = 1: xp

m4 = 2: cos(x)

m4 = 3:

https://www.derivative-calculator.net/

Question:

Calculate derivative, using Chain Rule for sin(Tx)

Question:

Differential

m4 = 0: d(f+g) =

m4 = 1: d(f-g) =

m4 = 2: d(fg) =

m4 = 3: d(f/g) =

Application of derivative

Question:

Increasing or decreasing:

m5 = 0. -6x

m5 = 1. 9x

m5 = 2. sin(x)

m5 = 3. cos(x)

m5 = 4. tan(x)

https://www.derivative-calculator.net/

Question:

Find min and Max.

Find the largest area rectangle with perimeter of T meters.

Calculate the largest area right-angled triangle with perimeter of T meters.

Find maximum volume cylinder for surface area of T meters square.

Calculate maximum volume cone for surface area of T meters square.

Calculate maximum area scalene triangle with perimeter of T meters.

Question:

Concave or convex:

m4 = 0: x3

m4 = 1: -x3

m4 = 2: cos(x)

m4 = 3: sin(x)

Question:

Find inflection point:

m4 = 0: x3

m4 = 1: -x3

m4 = 2: cos(x)

m4 = 3: sin(x)

Linear regression:

Question:

Find linear least-square approximation for your dataset.

(2, m2), (3, m3), (4, m4)

Dim x(3), y(3)

m = 3

x(1) = 46

x(2) = 17

x(3) = 26

y(1) = 21

y(2) = 63

y(3) = 11

sx = 0

For j = 1 To m

sx = sx + x(j)

Next j

sy = 0

For j = 1 To m

sy = sy + y(j)

Next j

sxy = 0

For j = 1 To m

sxy = sxy + x(j) \* y(j)

Next j

sx2 = 0

For j = 1 To m

sx2 = sx2 + x(j) ^ 2

Next j

g = (m \* sxy - sx \* sy) / (m \* sx2 - sx ^ 2)

i = (sy - g \* sx) / m

MsgBox g

MsgBox i

https://calculus17.weebly.com/uploads/7/7/9/0/77906190/3points\_group\_task\_25oct2018.txt

Diffusion

Substance S diffuses in time in one dimension x.

 (equation)

 (boundary condition)

 (solution)