Module 6A: Functions

MTH 225
12 Oct 2020

Agenda

- Review of Daily Prep activity + Q/A time
- Activities:
  - Finding domains, ranges, and codomains of functions
  - Finding images and compositions
  - A special function
- Q&A and quizzing

Consider the mapping $g : \{1, 2, 3\} \to \{a, b, c\}$ given by the "two line" notation $g = \begin{pmatrix} 1 & 2 & 3 \\ c & a & a \end{pmatrix}$. Then:

- g is not a function
- g is a function, and its domain is $\{a, c\}$.
- g is a function, and its domain is $\{a, b, c\}$.
- g is a function, and its domain is $\{1, 2, 3\}$.

Consider the function $g : \{1, 2, 3\} \to \{a, b, c\}$ given by the "two line" notation $g = \begin{pmatrix} 1 & 2 & 3 \\ c & a & a \end{pmatrix}$. Then:

- Both the codomain and the range of g are $\{a, b, c\}$
- The range of g is $\{a, b, c\}$, but the codomain of g is $\{a, c\}$
- The codomain of g is $\{a, b, c\}$, but the range of g is $\{a, c\}$
- Both the codomain and the range of g are $\{a, c\}$,

Here's a function in Python, along with a sample of how it works. The domain and codomain of this function are

```
[1] def repeat_myself(n):
      return n*"foobar"

[2] print(repeat_myself(5))

    foobarfoobarfoobarfoobarfoobar
```

- Domain = "Strings", Codomain = $\mathbb{N}$
- Domain = $\mathbb{N}$, Codomain = $\mathbb{N}$
- Domain = $\mathbb{N}$, Codomain = { All strings }
- Domain = $\mathbb{Z}$, Codomain = { All strings }

To 0

Here's the repeat_myself function again. True or False: The *range* of this function is the set of all Python strings.

```
[1]  def repeat_myself(n):
       return n*"foobar"
```

```
[2]  print(repeat_myself(5))
```

```
     foobarfoobarfoobarfoobarfoobar
```

True

False

Practice with functions -- Jamboard

A special function

```
def c(n):
  if n % 2 == 0:
    return n/2
  else:
    return 3*n+1
```

$$c(n) = \begin{cases} n/2 & \text{if } n \text{ is even} \\ 3n+1 & \text{if } n \text{ is odd} \end{cases}$$

What happens when we put a number into c, then put the output back into c, then put *that* output back into c, and so on?

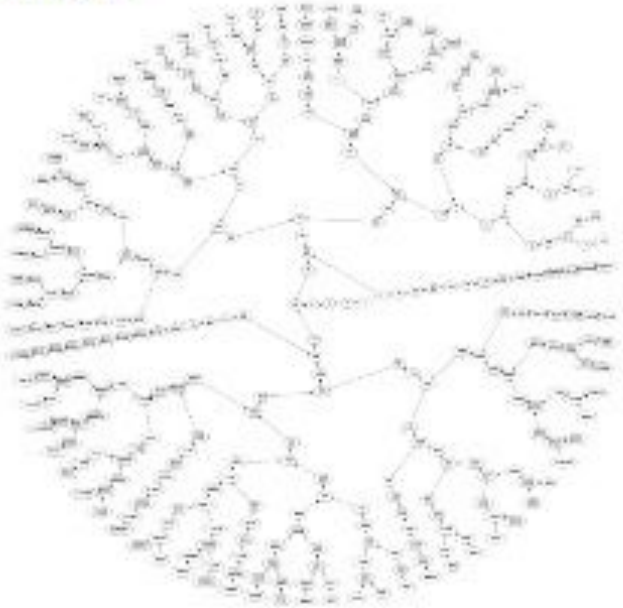
No matter what n we start with, the iterated sequence of output values from this function always eventually reaches 1.

- True
- False
- I don't know

Collatz Conjecture

Paul Erdos: "Mathematics is not ready for such problems."

Jeffrey Lagarias: "This is an extraordinarily difficult problem, completely out of reach of present day mathematics."



Have a great day 😀

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