

Function Examples

Announcements

Function Implementation Practice

A Slight Variant of Fall 2022 Midterm 1 3(b)

Implement `nearest_prime`, which takes an integer `n` above 5. It returns the nearest prime number to `n`. If two prime numbers are equally close to `n`, return the larger one. Assume `is_prime(n)` is implemented already.

```
def nearest_prime(n):  
    """Return the nearest prime number to n.  
    In a tie, return the larger one.
```

```
>>> nearest_prime(8)  
7  
>>> nearest_prime(11)  
11  
>>> nearest_prime(21)  
23  
"""
```

```
while True:  
    if ____:  
  
    if ____:  
        k = -k  
    else:  
        ____
```

From discussion:

Describe a process (in English) that computes the output from the input using simple steps.

Figure out what additional names you'll need to carry out this process.

Implement the process in code using those additional names.

From the videos:

Read the description

Verify the examples & pick a simple one

Read the template

Annotate names with values from your chosen example

Write code to compute the result

Did you really return the right thing?

Check your solution with the other examples

Currying

Function Currying

```
def make_adder(n):  
    return lambda k: n + k
```

```
>>> make_adder(2)(3)  
5  
>>> add(2, 3)  
5
```

There's a general
relationship between
these functions

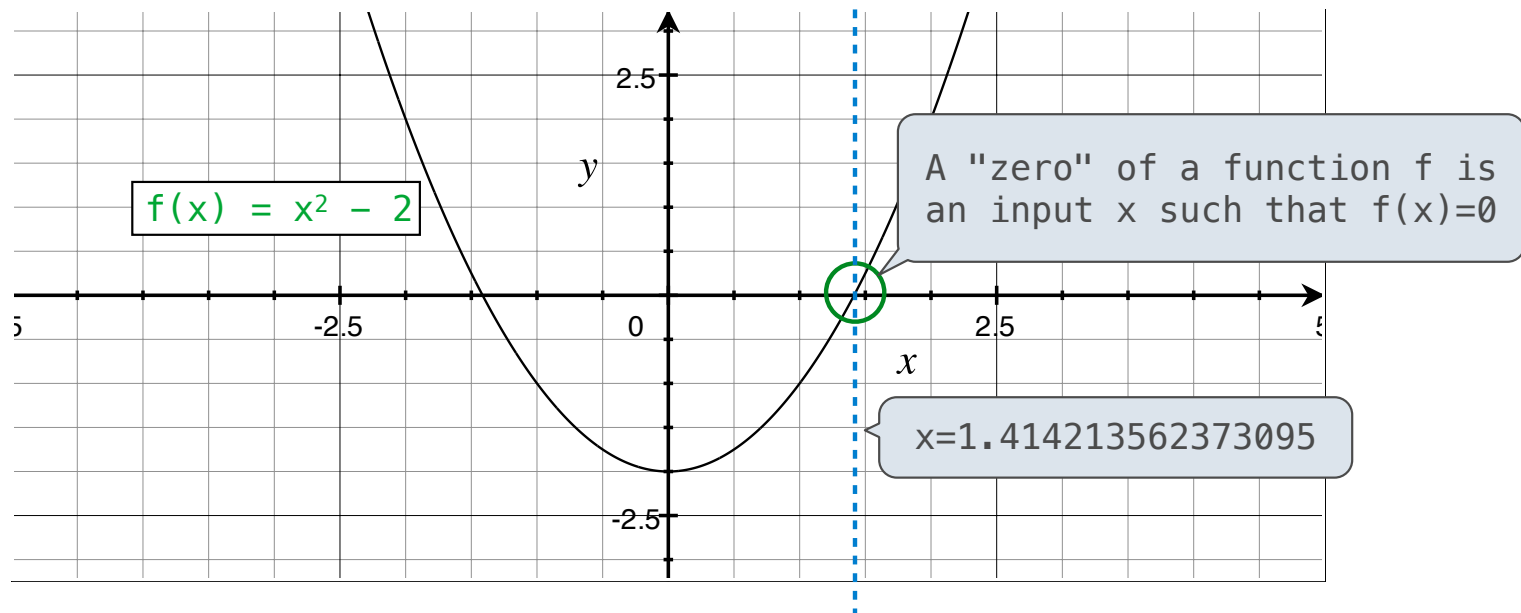
(Demo)

Curry: Transform a multi-argument function into a single-argument, higher-order function

Example: Newton's Method (OPTIONAL)

Newton's Method Background

Quickly finds accurate approximations to zeroes of differentiable (smooth) functions



Application: a method for computing square roots, cube roots, etc.

The positive zero of $f(x) = x^2 - a$ is \sqrt{a} . (We're solving the equation $x^2 = a$.)

Newton's Method

Given a function f and initial guess x ,

Repeatedly improve x :

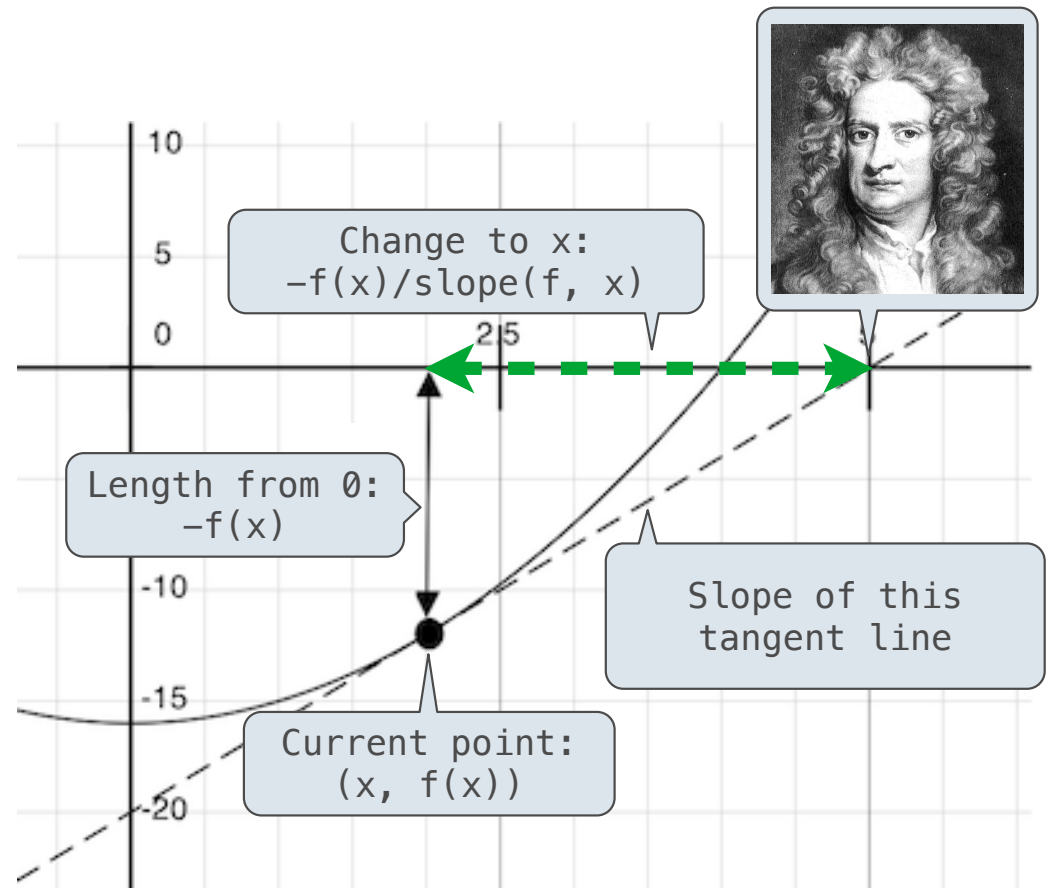
Compute the value of f at the guess: $f(x)$

Compute the slope of f at the guess: $\text{slope}(f, x)$

Update guess x to be:

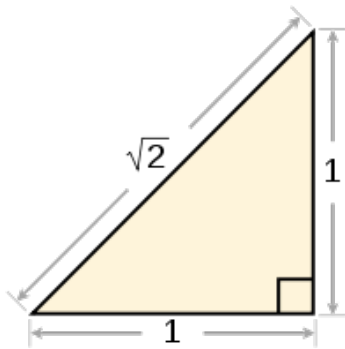
$$x - \frac{f(x)}{\text{slope}(f, x)}$$

Finish when $f(x) = 0$ (or close enough)



Using Newton's Method

How to find the square root of 2?



```
>>> f = lambda x: x*x - 2
```

```
>>> find_zero(f)
```

```
1.4142135623730951
```

Applies Newton's method