

Exercises

FOSSEE

Department of Aerospace Engineering
IIT Bombay

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Day 2, Session 6

Problem 1.1

The aliquot of a number is defined as: the sum of the *proper* divisors of the number. For example:

$$\text{aliquot}(12) = 1 + 2 + 3 + 4 + 6 = 16.$$

Write a function that returns the aliquot number of a given number.

Problem 1.2

Pair of numbers (a, b) is said to be **amicable** if aliquot number of a is b and aliquot number of b is a .

Example: 220, 284

Write a program that prints all four digit amicable pairs.

20 m

Problem 2

Given a string of numbers like, “1, 3-7, 12, 15, 18-21”,
produce the following list

[1, 3, 4, 5, 6, 7, 12, 15, 18, 19, 20, 21]

30 m

Problem 3

Given a list of words, find all the anagrams in the list.
Solve the problem without using dictionaries.

Problem 4

Count frequencies of words in a file named 'holmes.txt'.

55 m

Problem set 4

Central difference

$$\frac{\sin(x + h) - \sin(x - h)}{2h}$$

```
In []: x = linspace(0, 2*pi, 100)
```

```
In []: y = sin(x)
```

```
In []: deltax = x[1] - x[0]
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- 1 Given this, get the finite difference of sin in the range 0 to 2*pi

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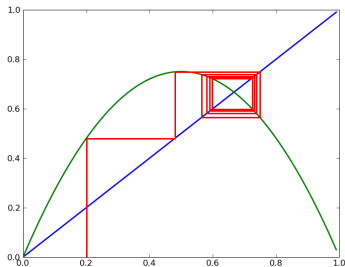
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Problem Set 5

- 5.1 Write a function that plots any regular n-gon given n .
- 5.2 Consider the logistic map, $f(x) = kx(1 - x)$, plot it for $k = 2.5, 3.5$ and 4 in the same plot.

Problem Set 5

- 3 Consider the iteration $x_{n+1} = f(x_n)$ where $f(x) = kx(1 - x)$. Plot the successive iterates of this proc as explained below.



Problem Set 5.3

Plot the cobweb plot as follows:

- 1 Start at $(x_0, 0)$ ($\implies i=0$)
- 2 Draw a line to $(x_i, f(x_i))$
- 3 Set $x_{i+1} = f(x_i)$
- 4 Draw a line to (x_{i+1}, x_{i+1})
- 5 ($i \implies i + 1$)
- 6 Repeat from 2 for as long as you want

75 m