

Data Structure

Project 1

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Part1

Matrix ADT

Objects: a list which have elements that same size of lists.

Functions:

- `__init__(self: Matrix, x: int, y: int):`
 - Initialize a matrix object which size is (x,y).
- `Matrix read(text: str):`
 - Read the text and create the Matrix(object) and return it
- `Matrix read_from_file(filename: str):`
 - Open the file, read the text and create Matrix.
- `Matrix identity(n: int):`
 - Create identity matrix of size n by n and return it
- `Matrix add(self: Matrix, other: Matrix):`
 - if self size and other matrix's size are equal, add two matrices and return it.
 - if not, raise error.
- `Matrix mul(self: Matrix, other: Matrix):`
 - If self col size and other matrix's row size are equal, multiply two matrices and return it.
 - If not, raise error.
- `Matrix transpose(self: Matrix):`
 - Transpose the self and return it
- `Boolean symmetric(self):`
 - If self is symmetric, return True
 - If not return False
- `Boolean eq(self: Matrix, other: Matrix):`
 - If self and other are same, return True

- If not return False

Part2

(1)

Attached project code and commented on source code.

(2)

-add: $O(mn)$ (calculating the $m \times n$ matrix)

-mul: $O(mnl)$ (calculating the $m \times n$ matrix and $n \times l$ matrix)

-transpose: $O(mn)$ (calculating the $m \times n$ matrix)

-symmetric: $O(mn)$ (calculating the $m \times n$ matrix)

-eq: $O(mn)$ (calculating the $m \times n$ matrix and $m \times n$ matrix)

Part3

Problem1

```
[dongminlee:project1/ (master✖) $ python3 project.py
```

```
##### problem 1 #####
```

```
##### (1) #####
```

```
[1, 0, 4]
[-1, 2, -2]
[0, -2, -3]
```

```
+
```

```
[-1, 3, 5]
[2, 2, -3]
[2, -3, 0]
```

```
=
```

```
[0, 3, 9]
[1, 4, -5]
[2, -5, -3]
```

```
##### (2) #####
```

```
[4, -3]
[3, -1]
[0, -2]
[-1, 5]
```

```
*
```

```
[-1, 3, 2, -2]
[0, -1, 4, -3]
```

```
=
```

```
[-4, 15, -4, 1]
[-3, 10, 2, -3]
[0, 2, -8, 6]
[1, -8, 18, -13]
```

Problem2

```
##### problem 2 #####
```

```
[2, 3, -1]  
[1, 2, 1]  
[-1, -1, 3]
```

```
*
```

```
[7, -8, 5]  
[-4, 5, -3]  
[1, -1, 1]
```

```
=
```

```
[1, 0, 0]  
[0, 1, 0]  
[0, 0, 1]
```

Since the result of the multiplication of the two matrices is an identity matrix, two matrices are in relation of inverse.

Problem3

(1)

Attached project code

(2)

```
##### problem 3 #####
```

```
[2, 3, -1]  
[1, 2, 1]  
[-1, -1, 3]
```

```
**
```

```
10
```

```
=
```

```
[116168, 244213, 206578]  
[-83157, -130674, 40264]  
[-287106, -533948, -213831]
```