```
from solution import CompositionMatrix as CM
import numpy as np
```

Two example matrices

```
A = [[1, 0, 0, -3, 0, 0],
     [0, 4, 0, 0, 7, 0],
     [0, 0, 5, 0, 0, 9],
     [2, 0, 0, -17, 0, 0],
     [0, 7, 0, 0, 9, 0],
     [0, 0, 13, 0, 0, -5]]
B = [[2, 0, 0, -1, 0, 0],
     [0, 1, 0, 0, -5, 0],
     [0, 0, 1, 0, 0, -17],
     [-2, 0, 0, 1, 0, 0],
     [0, -9, 0, 0, 9, 0],
     [0, 0, -11, 0, 0, 15]]
```

Their associated representative matrices

Definitions of representative matrices of a matrix is given in the write-up document.

```
a = [[[1, -3],
      [2, - 17]],
     [[4, 7],
      [7, 9]],
     [[5, 9],
      [13, -5]]]

b = [[[2, -1],
      [-2, 1]],
     [[1, -5],
      [-9, 9]],
     [[1, -17],
      [-11, 15]]]
```

Elementary Operations

```
CA = CM(a) ## Composition matrix for A
CB = CM(b) ## Composition matrix for B
```

A+B with CA + CB

```
Csum = CA + CB
print("Representation matrices of Csum:\n", np.array(Csum.r))
```

```
Representation matrices of Csum:
 [[[  3  -4]
```

```
  [  0 -16]]

 [[  5   2]
  [ -2  18]]

 [[  6  -8]
  [  2  10]]]
```

Checking with the full view

```
print(np.array(Csum.transform()))
```

```
[[  3   0   0  -4   0   0]
 [  0   5   0   0   2   0]
 [  0   0   6   0   0  -8]
 [  0   0   0 -16   0   0]
 [  0  -2   0   0  18   0]
 [  0   0   2   0   0  10]]
```

A*B with CA* CB

```
Cdot = CA * CB
print("Representation matrices of Cdot:\n", np.array(Cdot.r))
```

```
Representation matrices of Cdot:
 [[[   8   -4]
  [  38  -19]]

 [[ -59   43]
  [ -74   46]]

 [[ -94   50]
  [  68 -296]]]
```

Checking with the full view

```
print(np.array(Cdot.transform()))
```

```
[[   8    0    0   -4    0    0]
 [   0  -59    0    0   43    0]
 [   0    0  -94    0    0   50]
 [  38    0    0  -19    0    0]
 [   0  -74    0    0   46    0]
 [   0    0   68    0    0 -296]]
```

Inverse of A

Note that the ~ operator is overloaded as if ~A = inverse(A)

```
Ainv =  ~CA
print("Representation matrices of Ainv:\n", np.array(Ainv.r))
```

```
Representation matrices of Ainv:
 [[[ 1.54545455  0.18181818]
  [-0.27272727 -0.09090909]]

 [[-0.69230769  0.53846154]
  [ 0.53846154 -0.30769231]]

 [[ 0.03521127  0.0915493 ]
  [ 0.06338028 -0.03521127]]]
```

Checking with the full view

```
print(np.array(Ainv.transform()))
```

```
[[ 1.54545455  0.          0.          0.18181818  0.          0.
]
 [ 0.         -0.69230769  0.          0.          0.53846154  0.
]
 [ 0.          0.          0.03521127  0.          0.
0.0915493 ]
 [-0.27272727  0.          0.         -0.09090909  0.          0.
]
 [ 0.          0.53846154  0.          0.         -0.30769231  0.
]
 [ 0.          0.          0.06338028  0.          0.          -
0.03521127]]
```