

Problem 1

October 16, 2023

```
[1]: import numpy as np
from numpy.linalg import inv, solve

A = np.array(
    [
        [1, -1, -1, -1, 0, 1],
        [0, -1, 0, 0, 1, 1],
        [1, -1, 1, -1, 0, -1],
        [-1, 0, -1, 0, -1, -1],
        [1, 0, 1, 1, 1, 0],
        [-1, 0, 1, 1, 1, 1],
    ]
)

b = np.array([[1], [2], [3], [4], [5], [6]])
```

0.1 a.

Compute the inverse matrix of A .

```
[2]: print(inv(A))
print(A @ inv(A))

[[ 0.5 -0.5  0.   0.   0.5  0. ]
 [-1.   0.5 -0.5 -1.  -0.5 -1. ]
 [ 0.5 -1.   0.5  0.   0.   1. ]
 [ 1.  -1.   0.   1.   1.   1. ]
 [-2.   2.5 -0.5 -1.  -0.5 -2. ]
 [ 1.  -1.   0.   0.   0.   1. ]]
[[1. 0. 0. 0. 0. 0.]
 [0. 1. 0. 0. 0. 0.]
 [0. 0. 1. 0. 0. 0.]
 [0. 0. 0. 1. 0. 0.]
 [0. 0. 0. 0. 1. 0.]
 [0. 0. 0. 0. 0. 1.]]
```

0.2 b.

Compute the solution x to $Ax = b$ using `inv`

```
[3]: x = inv(A) @ b
      print(x)
      print(A @ x == b)
```

```
[[ 2.]
 [-14.]
 [ 6.]
 [ 14.]
 [-17.]
 [ 5.]]
[[ True]
 [ True]
 [ True]
 [ True]
 [ True]
 [ True]]
```

1 c.

Compute the solution x to $Ax = b$ in Python using `solve`

```
[4]: x = solve(A, b)
      print(x)
      print(A @ x == b)
```

```
[[ 2.]
 [-14.]
 [ 6.]
 [ 14.]
 [-17.]
 [ 5.]]
[[ True]
 [ True]
 [ True]
 [ True]
 [ True]
 [ True]]
```

1.1 d.

See in previous prints