

H.W

- compute the inverse of the matrix. Both manually and using Python

$$A = \begin{bmatrix} 2 & -3 \\ 4 & 4 \end{bmatrix}$$

$$B = \begin{bmatrix} 3 & 1 \\ 5 & 2 \end{bmatrix}$$

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 5 & 3 \\ 1 & 0 & 8 \end{bmatrix}$$

```
In [2]: import numpy as np
```

```
In [6]: A = np.array([[2,-3],[4,4]]) # matrix A(2,2)
A
```

```
Out[6]: array([[ 2, -3],
               [ 4,  4]])
```

```
In [11]: A_inverse = np.linalg.inv(A) # inverse matrix A
A_inverse
```

```
Out[11]: array([[ 0.2 ,  0.15],
               [-0.2 ,  0.1 ]])
```

```
In [12]: B = np.array([[3,1],[5,2]]) # matrix B(2,2)
B
```

```
Out[12]: array([[3, 1],
               [5, 2]])
```

```
In [13]: B_inverse = np.linalg.inv(B) # inverse matrix B
B_inverse
```

```
Out[13]: array([[ 2., -1.],
               [-5.,  3.]])
```

```
In [14]: A = np.array([[1,2,3],[2,5,3],[1,0,8]]) # matrix A(3,3)
A
```

```
Out[14]: array([[1, 2, 3],
               [2, 5, 3],
               [1, 0, 8]])
```

```
In [19]: A_inverse = np.linalg.inv(A)    # inverse matrix A
A_inverse
```

```
Out[19]: array([[ -40.,  16.,   9.],
                [ 13.,  -5.,  -3.],
                [   5.,  -2.,  -1.]])
```

H.W

■ use the inverse matrices to find

(a) $(AB)^{-1}$, (b) $(A^T)^{-1}$, (c) A^{-2} , and (d) $(2A)^{-1}$.

$$A^{-1} = \begin{bmatrix} 2 & 5 \\ -7 & 6 \end{bmatrix}, \quad B^{-1} = \begin{bmatrix} 7 & -3 \\ 2 & 0 \end{bmatrix}$$

Both manually and using Python

```
In [29]: #a)
AB_inverse = np.dot(np.array([[7, -3], [2, 0]]), np.array([[2, 5], [-7, 6]]))
AB_inverse
```

```
Out[29]: array([[35, 17],
                [ 4, 10]])
```

```
In [30]: #b)
A_transpose_inverse = np.array([[2, 5], [-7, 6]]).T
A_transpose_inverse
```

```
Out[30]: array([[ 2, -7],
                [ 5,  6]])
```

```
In [31]: #c)
A_pow = np.square(np.array([[2, 5], [-7, 6]]))
A_pow
```

```
Out[31]: array([[ 4, 25],
                [49, 36]], dtype=int32)
```

```
In [33]: #d)
A_inverse_multiply = 1 / 2 * np.array([[2, 5], [-7, 6]])
A_inverse_multiply
```

```
Out[33]: array([[ 1. ,  2.5],
                [-3.5,  3. ]])
```

H.W

- find A provided that

$$(2A)^{-1} = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}.$$

$$(4A)^{-1} = \begin{bmatrix} 2 & 4 \\ -3 & 2 \end{bmatrix}.$$

Both manually and using Python

```
In [34]: #a)
A = 1 / 2 * np.linalg.inv(np.array([[1,2],[3,4]]))
A
```

```
Out[34]: array([[ -1.   ,  0.5  ],
               [ 0.75, -0.25]])
```

```
In [35]: #b)
A = 1 / 4 * np.linalg.inv(np.array([[2,4],[-3,2]]))
A
```

```
Out[35]: array([[ 0.03125 , -0.0625  ],
               [ 0.046875,  0.03125 ]])
```

#####

