Activation (ReLU, Sigmoid, Tanh)

Exercise 1

3	x_1
2	x_2

W		b
1	-1	0
1	-2	0
1	-3	0

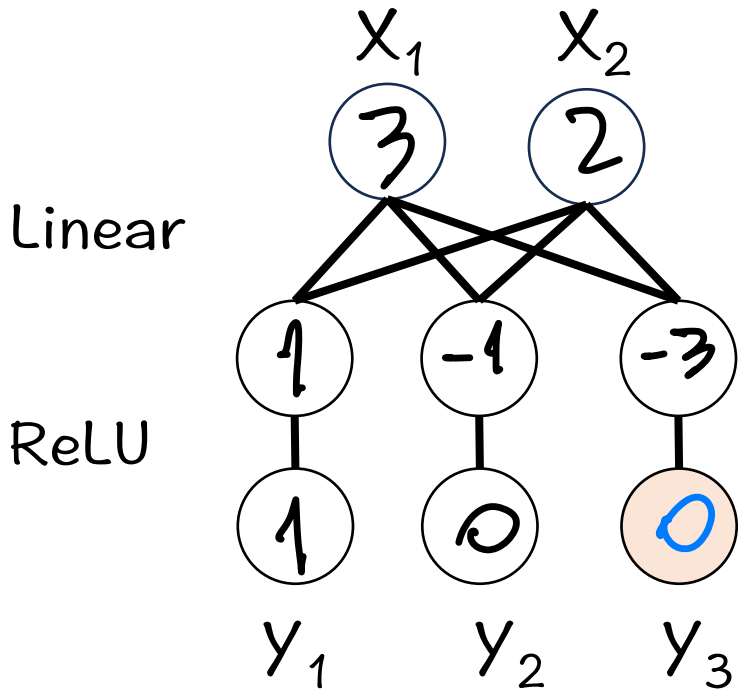
1

1
-1
-3

ReLU

≈

1	y_1
0	y_2
0	y_3



0

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Activation (ReLU, Sigmoid, Tanh)

Exercise 2

3	x_1
2	x_2

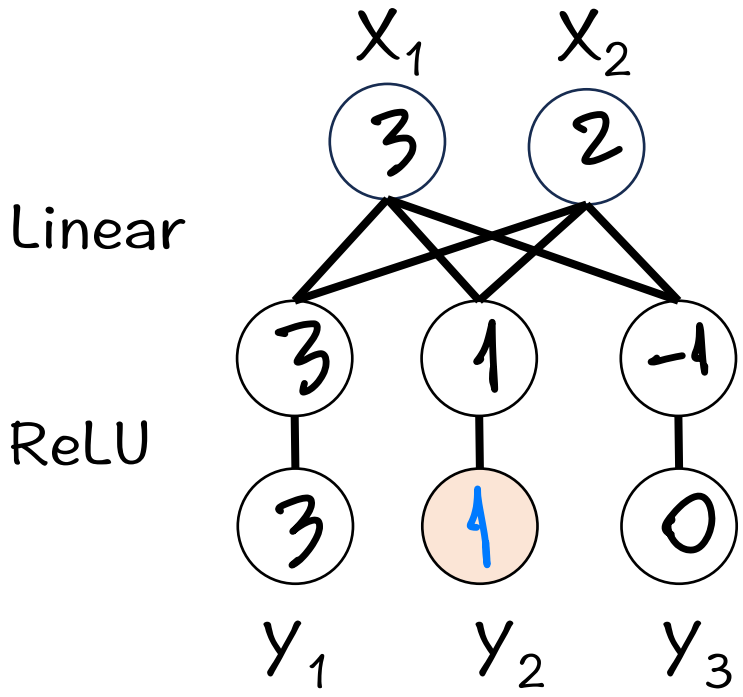
W		b
1	1	-2
1	1	-4
1	1	-6

1

3	
1	
-1	

ReLU ≈

3	y_1
1	y_2
0	y_3



1

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Activation (ReLU, Sigmoid, Tanh)

Exercise 3

5	ReLU ≈	5
4		4
3		3
2		2
1		1
0		0
-1		0
-2		0
-3		0
-4		0
-5		0

5

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Activation (ReLU, Sigmoid, Tanh)

Exercise 4

0

Activation (ReLU, Sigmoid, Tanh)

Exercise 5

2				1
0		Sigmoid σ{3} ≈		0.5
-2				0

3 Level Quantization
for hand calculation ✍️

Integer	Sigmoid
>= 2	1
-1, 0, 1	0.5
<= -2	0

0.5

Activation (ReLU, Sigmoid, Tanh)

Exercise 6

-3	Sigmoid	0
1	σ{3}	0.5
-1	≈	0.5

3 Level Quantization
for hand calculation ✍️

Integer	Sigmoid
>= 2	1
-1, 0, 1	0.5
<= -2	0

0.5

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Activation (ReLU, Sigmoid, Tanh)

Exercise 7

-9	Sigmoid	0
-5	σ{3}	0
-4	≈	0

3 Level Quantization
for hand calculation ✍️

Integer	Sigmoid
>= 2	1
-1, 0, 1	0.5
<= -2	0

0

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Activation (ReLU, Sigmoid, Tanh)

Exercise 8

11		Sigmoid		1
7		$\sigma\{3\}$		1
4		$\approx$		1

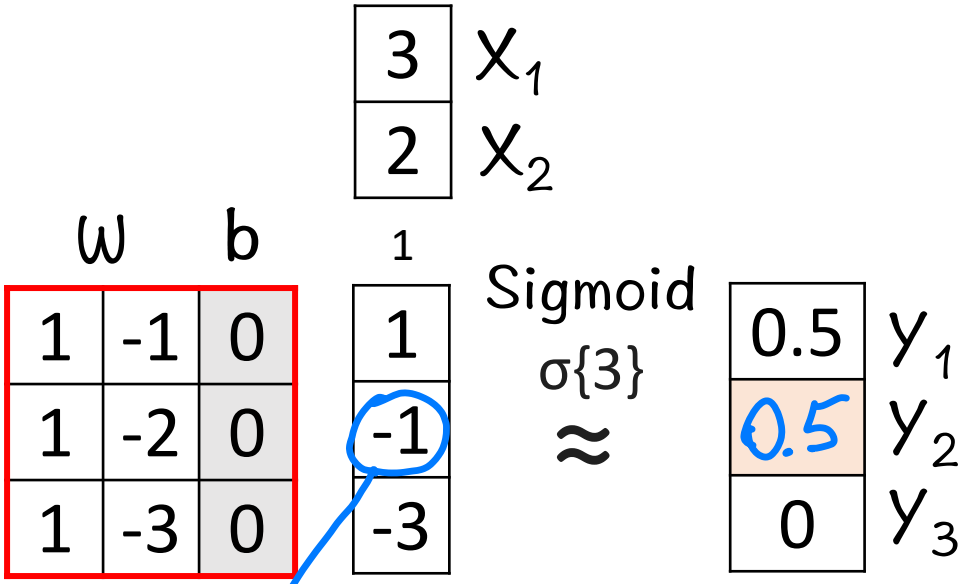
3 Level Quantization
for hand calculation ✍️

Integer	Sigmoid
>= 2	1
-1, 0, 1	0.5
<= -2	0

1

Activation (ReLU, Sigmoid, Tanh)

Exercise 9



3 Level Quantization
for hand calculation ✍️

Integer	Sigmoid
>= 2	1
-1, 0, 1	0.5
<= -2	0

0.5

Activation (ReLU, Sigmoid, Tanh)

Exercise 10

3	X_1
2	X_2

W		b
1	-1	3
1	-2	3
1	-3	3

1

4
2
0

Sigmoid

$\sigma\{3\}$

$\approx$

1	y_1
1	y_2
0.5	y_3

---

3 Level Quantization
for hand calculation ✍️

Integer	Sigmoid
>= 2	1
-1, 0, 1	0.5
<= -2	0

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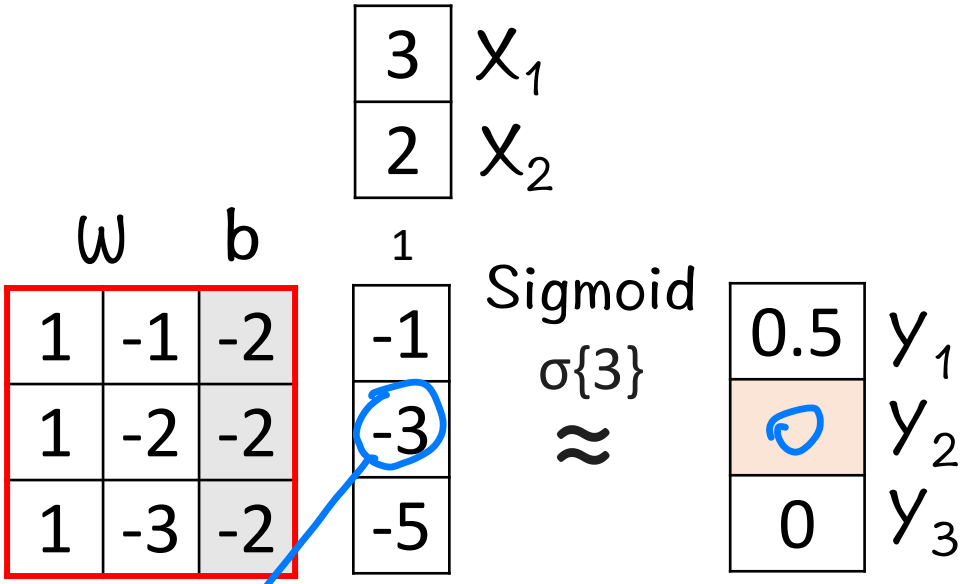
Activation (ReLU, Sigmoid, Tanh)

Exercise 11



3 Level Quantization
for hand calculation ✍️

Integer	Sigmoid
>= 2	1
-1, 0, 1	0.5
<= -2	0

0

Activation (ReLU, Sigmoid, Tanh)

Exercise 12

3 Level Quantization
for hand calculation ✍️

Integer	Sigmoid	Tanh
>= 2	1	1
-1, 0, 1	0.5	0
<= -2	0	-1

0

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Activation (ReLU, Sigmoid, Tanh)

Exercise 13

-9
-5
-4

Tanh{3}

≈

-1
-1
-1

3 Level Quantization
for hand calculation ✍️

Integer	Sigmoid	Tanh
>= 2	1	1
-1, 0, 1	0.5	0
<= -2	0	-1

-1

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Activation (ReLU, Sigmoid, Tanh)

Exercise 14

11
7
4

Tanh{3}

≈

1
1
1

3 Level Quantization
for hand calculation ✍️

Integer	Sigmoid	Tanh
>= 2	1	1
-1, 0, 1	0.5	0
<= -2	0	-1

1

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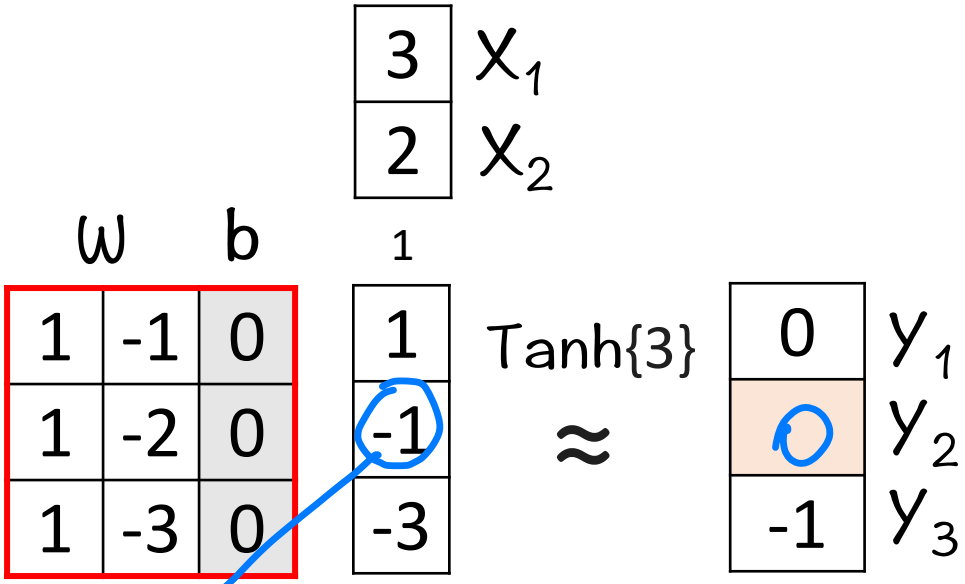
Activation (ReLU, Sigmoid, Tanh)

Exercise 15



3 Level Quantization
for hand calculation ✍️

Integer	Sigmoid	Tanh
>= 2	1	1
-1, 0, 1	0.5	0
<= -2	0	-1

0

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Activation (ReLU, Sigmoid, Tanh)

Exercise 16

3	X_1
2	X_2

W		b
1	-1	3
1	-2	3
1	-3	3

1

4	
2	
0	

Tanh{3} ≈

1	y_1
1	y_2
0	y_3

3 Level Quantization
for hand calculation ✍️

Integer	Sigmoid	Tanh
>= 2	1	1
-1, 0, 1	0.5	0
<= -2	0	-1

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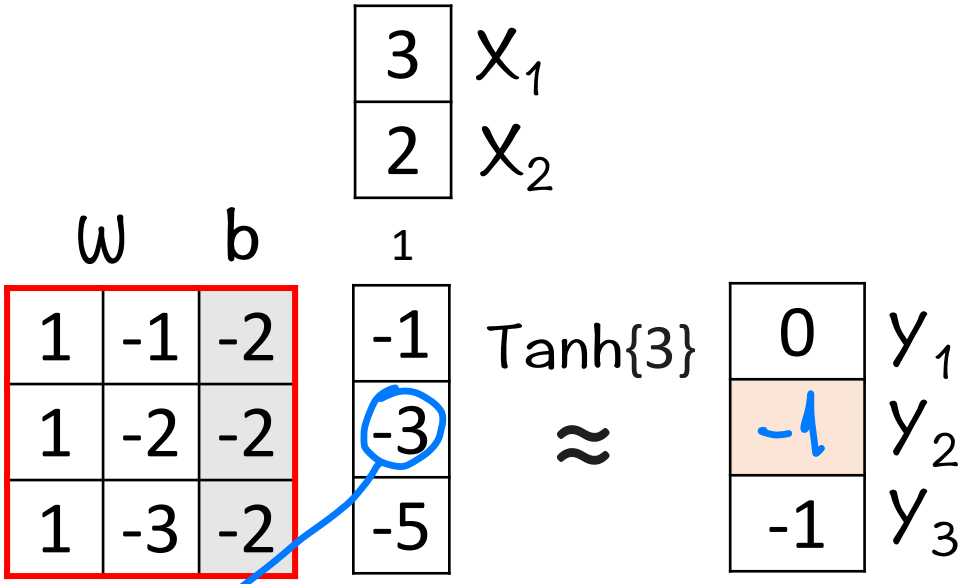
Activation (ReLU, Sigmoid, Tanh)

Exercise 17



3 Level Quantization
for hand calculation ✍️

Integer	Sigmoid	Tanh
>= 2	1	1
-1, 0, 1	0.5	0
<= -2	0	-1

-1

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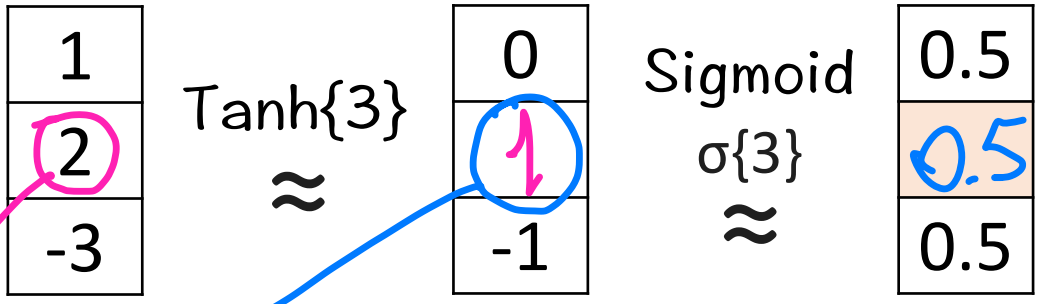
Activation (ReLU, Sigmoid, Tanh)

Exercise 18



3 Level Quantization
for hand calculation ✍️

Integer	Sigmoid	Tanh
>= 2	1	1
-1, 0, 1	0.5	0
<= -2	0	-1

0.5

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Activation (ReLU, Sigmoid, Tanh)

Exercise 19

1
2
-3

ReLU ≈

1
2
0

Sigmoid σ{3} ≈

0.5
1
0.5

3 Level Quantization
for hand calculation ✍️

Integer	Sigmoid	Tanh
>= 2	1	1
-1, 0, 1	0.5	0
<= -2	0	-1

0.5

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Activation (ReLU, Sigmoid, Tanh)

Exercise 20

0	Sigmoid	0.5
1	σ{5}	0.7
-1	≈	0.3

5 Level Quantization
for hand calculation ✍️

Integer	Sigmoid
>= 2	1
1	0.7
0	0.5
-1	0.3
<= -2	0

0.7

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Activation (ReLU, Sigmoid, Tanh)

Exercise 21

3	X_1
2	X_2

W		b
1	1	-2
1	1	-4
1	1	-6

1

3
1
-1

Sigmoid $\sigma\{5\} \approx$

1	y_1
0.7	y_2
0.3	y_3

5 Level Quantization for hand calculation ✍️

Integer	Sigmoid
>= 2	1
1	0.7
0	0.5
-1	0.3
<= -2	0

0.3

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Activation (ReLU, Sigmoid, Tanh)

Exercise 22

0	Tanh{5}	0
1	≈	0.8
-1		-0.8

5 Level Quantization
for hand calculation ✍️

Integer	Sigmoid	Tanh
>= 2	1	1
1	0.7	0.8
0	0.5	0
-1	0.3	-0.8
<= -2	0	-1

0.8

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Activation (ReLU, Sigmoid, Tanh)

Exercise 23

3	X_1
2	X_2

W		b
1	1	-2
1	1	-4
1	1	-6

1

3
1
-1

Tanh{5} ≈

1	y_1
0.8	y_2
-0.8	y_3

5 Level Quantization
for hand calculation ✍️

Integer	Sigmoid	Tanh
>= 2	1	1
1	0.7	0.8
0	0.5	0
-1	0.3	-0.8
<= -2	0	-1

-0.8

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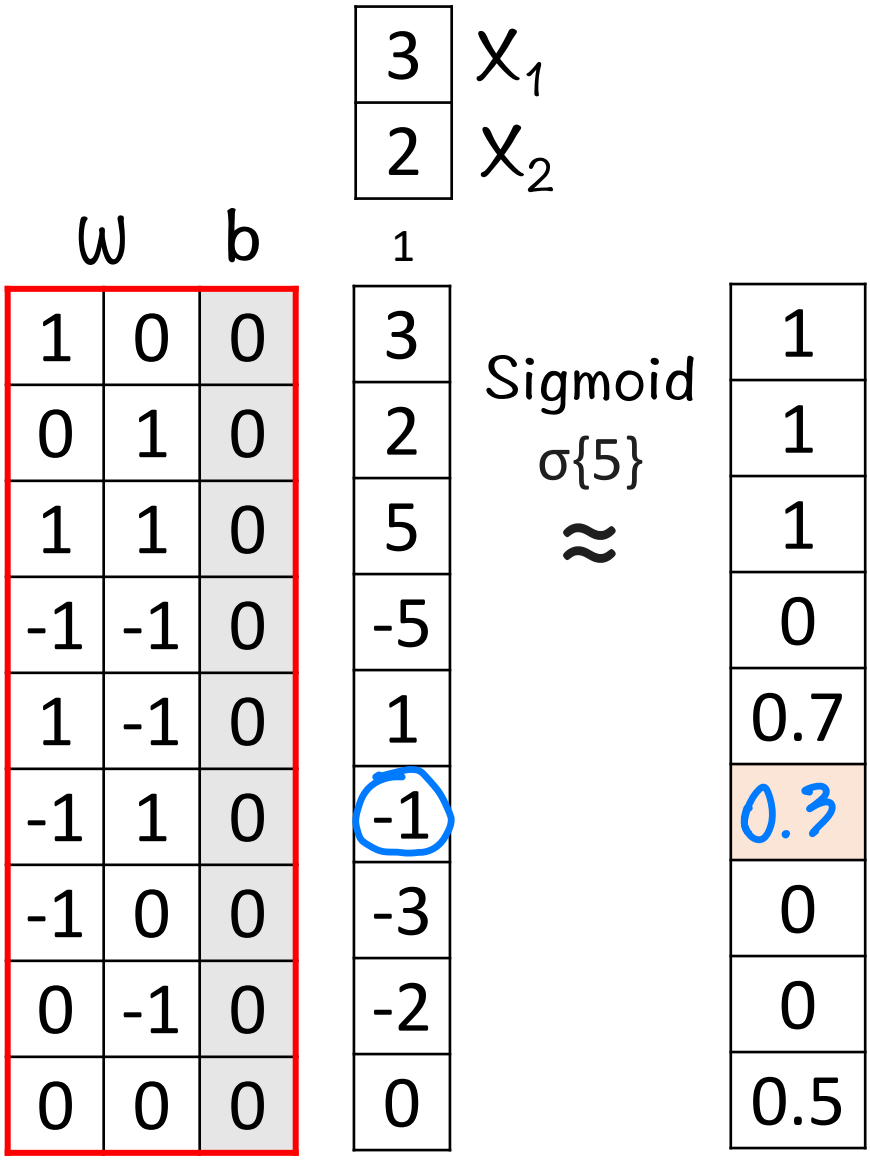
Activation (ReLU, Sigmoid, Tanh)

Exercise 24



0.3

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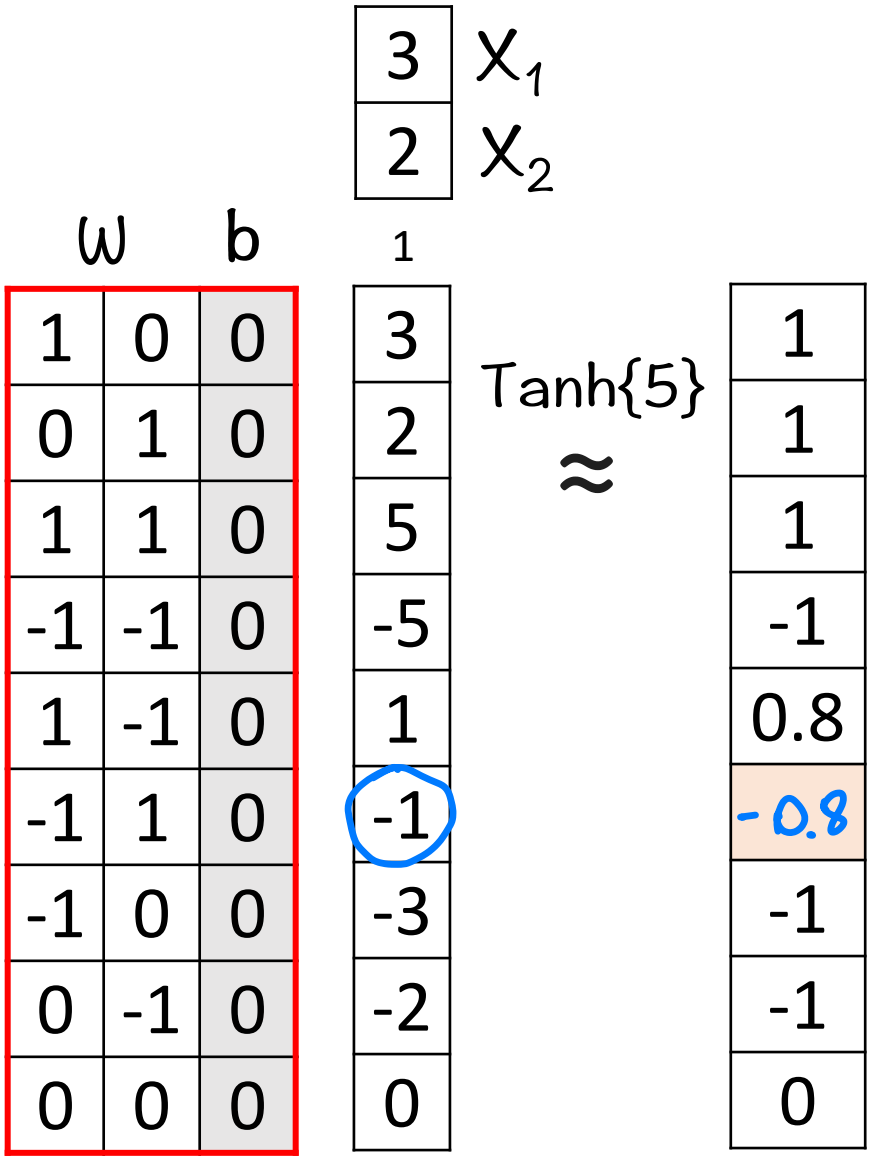
Activation (ReLU, Sigmoid, Tanh)

Exercise 25



-0.8

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