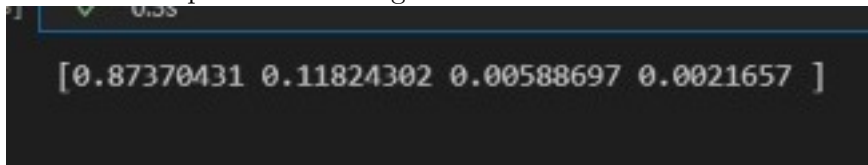# Soft Max

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2.1 What is the softmax of the vector [5, 3, 0, -1]?

```
import numpy as np
V = np.array([5,3,0,-1]);
updated_V = V - np.max(V)
exp = np.exp(updated_V)
soft_max = exp / np.sum(exp)
print(soft_max)
```

Shifted V helps in normalising the values an


```
[0.87370431 0.11824302 0.00588697 0.0021657 ]
```

soft max of [5, 3, 0, -1] is [0.87370431 0.11824302 0.00588697 0.0021657]

2.2 What is the jacobian of the softmax function at [5, 3, 0, -1]?

```
res = np.zeros((4,4))
for i in range (len(soft_max)):
    for j in range (len(soft_max)):
     if i != j :
         res[i][j] = (- soft_max[i] * soft_max[j])
     else:
         res[i][j] = (soft_max[i] * (1-soft_max[j]))
print(res)
```

```
[78]  ✓  0.1s

...   [[ 1.10345089e-01 -1.03309436e-01 -5.14347397e-03 -1.89217833e-03]
       [-1.03309436e-01  1.04261608e-01 -6.96093507e-04 -2.56078490e-04]
       [-5.14347397e-03 -6.96093507e-04  5.85231688e-03 -1.27493973e-05]
       [-1.89217833e-03 -2.56078490e-04 -1.27493973e-05  2.16100622e-03]]
```

Jacobian of the softmax function at [5, 3, 0, -1]

```
[[1.10345089e-01 -1.03309436e-01 -5.14347397e-03 -1.89217833e-03]
 [-1.03309436e-01 1.04261608e-01 -6.96093507e-04 -2.56078490e-04]
 [-5.14347397e-03 -6.96093507e-04 5.85231688e-03 -1.27493973e-05]
 [-1.89217833e-03 -2.56078490e-04 -1.27493973e-05 2.16100622e-03]]
```