Assignment 1 writeup

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1 Problem 1

(a)

We have

$$\begin{aligned}
\text{softmax}(\mathbf{x}+c)_i &= \frac{e^{x_i+c}}{\sum_j e^{x_j+c}} \\
&= \frac{e^c(e^{x_i})}{e^c \sum_j e^{x_j}} \\
&= \frac{e^c}{e^c} \frac{e^{x_i}}{\sum_j e^{x_j}} \\
&= \frac{e^{x_i}}{\sum_j e^{x_j}} \\
&= \text{softmax}(\mathbf{x})_i,
\end{aligned}$$

so $\text{softmax}(\mathbf{x}+c) = \text{softmax}(\mathbf{x})$, as desired.