Neural Network

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# Manual Calculations

For raw manual calculations, please see appendix *Figure 1*. After a complete forward pass and backpropagation for 1 epoch, the weights were updated to as seen in Table 1.

|  |  |  |
| --- | --- | --- |
| W | Original Weight | New Weight |
| 1 | 0.1 | 0.099929 |
| 2 | 0.2 | 0.199997 |
| 3 | 0.1 | 0.099958 |
| 4 | 0.1 | 0.099972 |
| 5 | 0.1 | 0.99309 |
| 6 | 0.1 | 0.099171 |
| 7 | 0.1 | 0.099306 |
| 8 | 0.2 | 0.199167 |

\*Note: Bias remained at 0.1 as it was not updated, hence weights (9, 10, 11 and 12 excluded)

After running this though my program, this is what results I got for 3 epochs

...

# Algorithm Overview

How it works

Observed errors?

# Verifying Correctness of Manual Calculations

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| W | Original Weights | Epoch 1 (Manual Calculation) | Epoch 1 (Algorithm) | Epoch 2 (Algorithm) | Epoch 3 (Algorithm) |
| 1 | 0.1 | 0.099929 | 0.09999292381459561 | 0.09998592491699507 | 0.09997900271500001 |
| 2 | 0.2 | 0.199997 | 0.1999892868242898 | 0.19997866970185157 | 0.19996814772105825 |
| 3 | 0.1 | 0.099958 | 0.09998906065180824 | 0.09997820950516348 | 0.09996744594356306 |
| 4 | 0.1 | 0.099972 | 0.09999859786088319 | 0.09999731132735014 | 0.09999613943115543 |
| 5 | 0.1 | 0.99309 | 0.09930886197388886 | 0.09862029820016521 | 0.09793430089602936 |
| 6 | 0.1 | 0.099171 | 0.09930570520953383 | 0.09861399492570555 | 0.09792486132556237 |
| 7 | 0.1 | 0.099306 | 0.09917137885954593 | 0.09834528380431987 | 0.09752170741326407 |
| 8 | 0.2 | 0.199167 | 0.19916741399056967 | 0.19833736693703355 | 0.19750985138826818 |

\*Bias remained at 0.1 for all epoch’s

Indicates it pretty accurately replicated the manual calculations, potentially just a few rounding or very minor errors.

# Testing code n test data

Accuracy vs Epoch graph

Maximum accuracy achieved

Make prediction for unlabelled test set  
Changing parameters

## Normal parameters

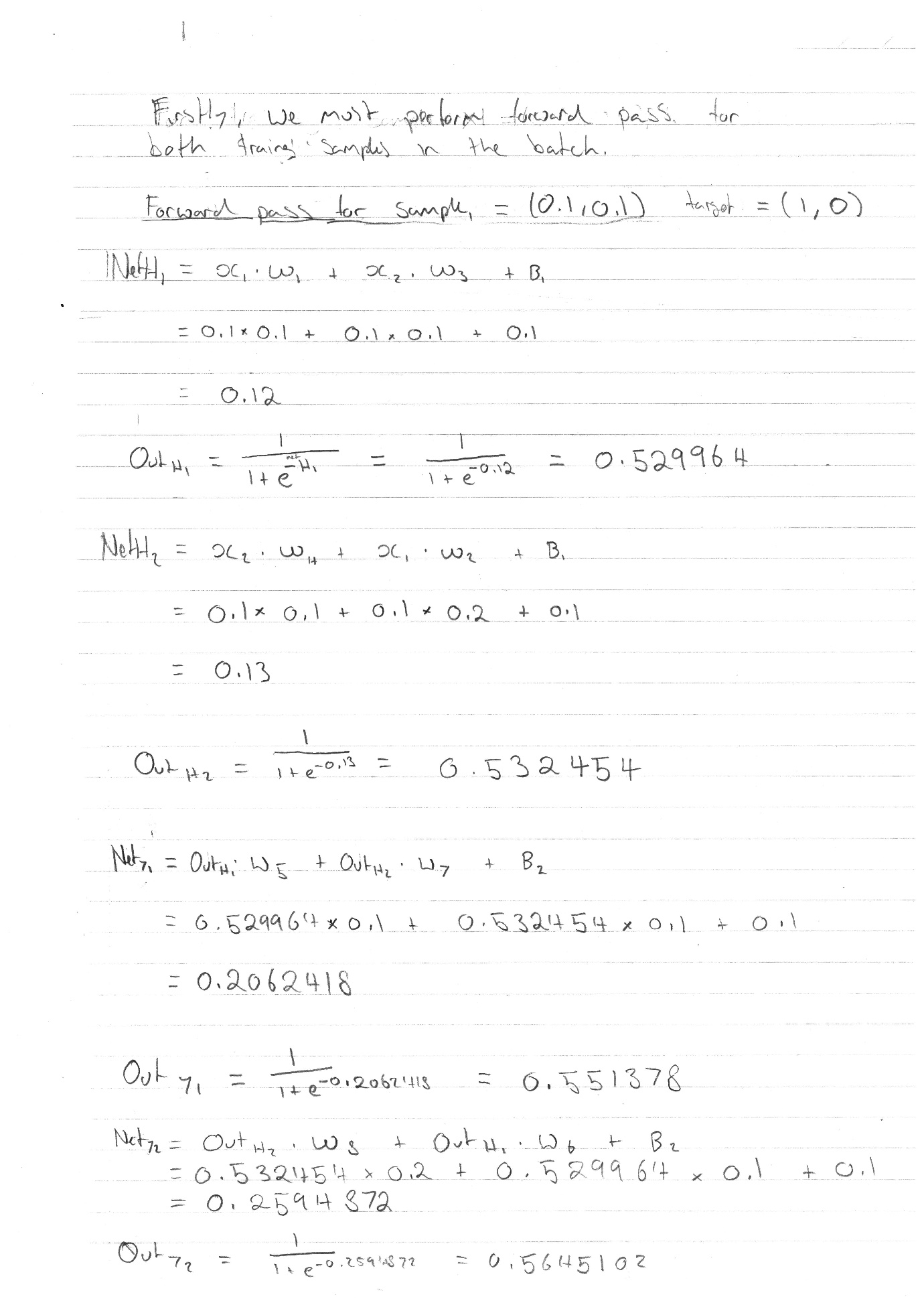
## Hyper Settings

# Alternate cost function

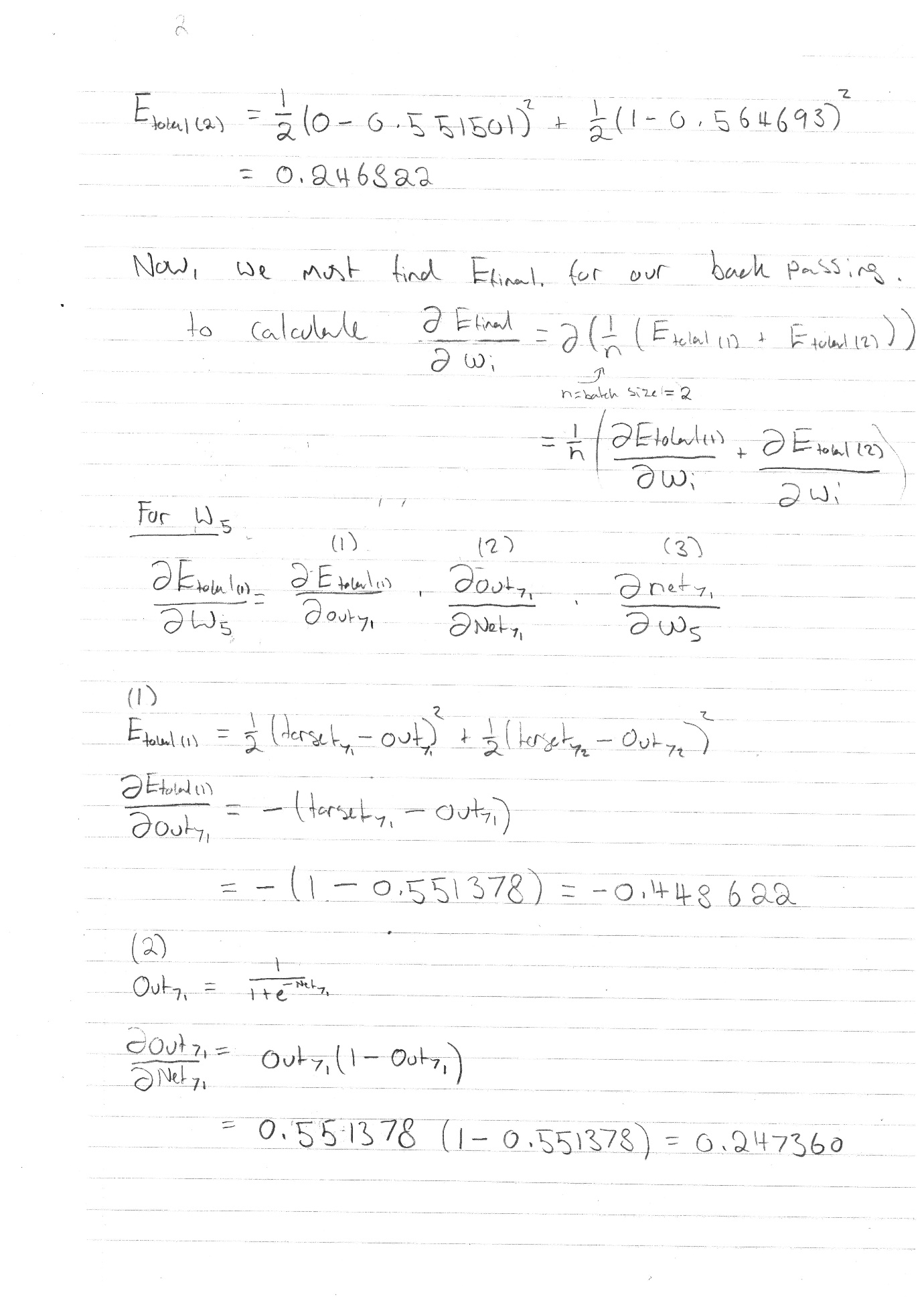
What is the test maximum accuracy achieved?

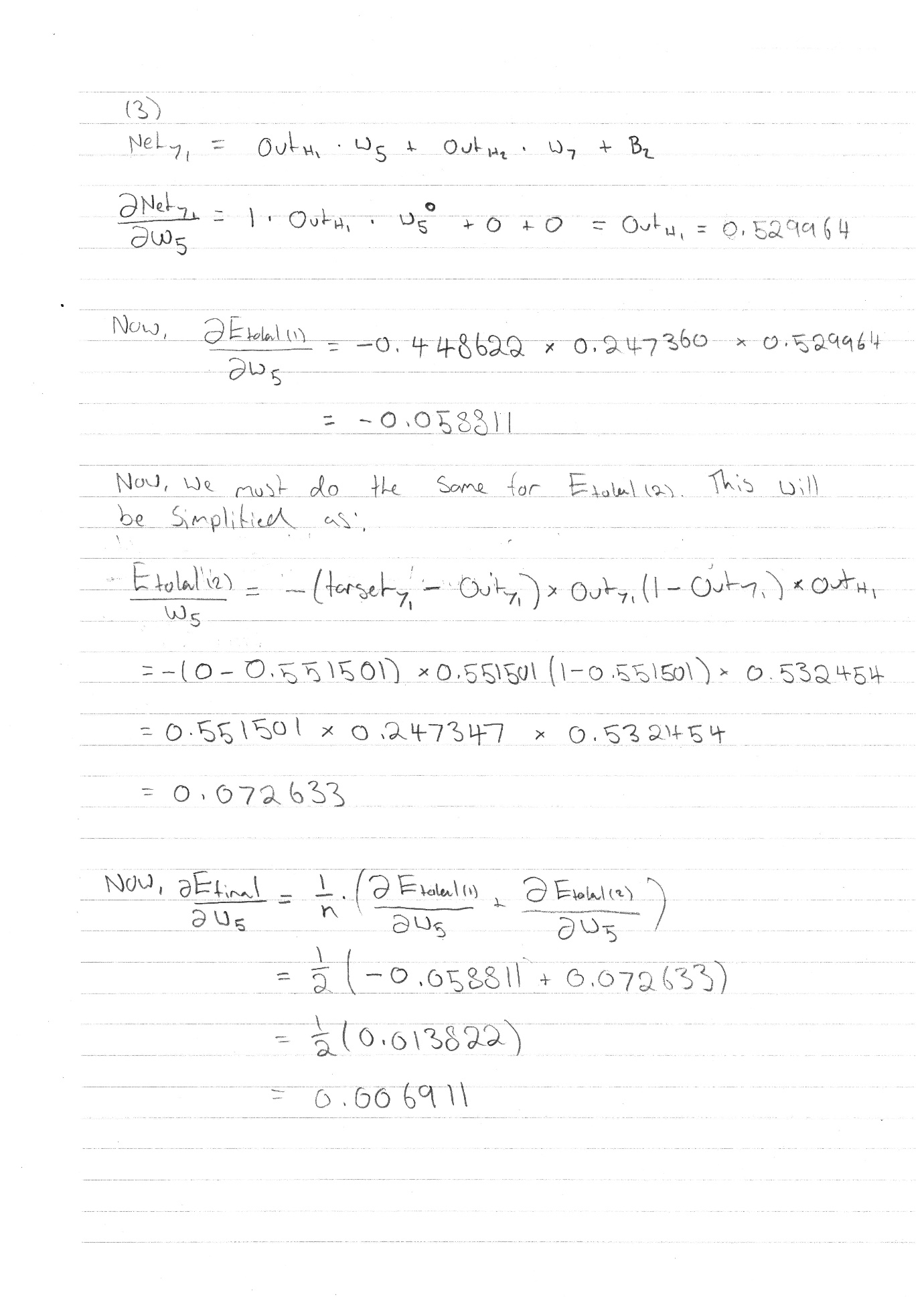
# Appendix

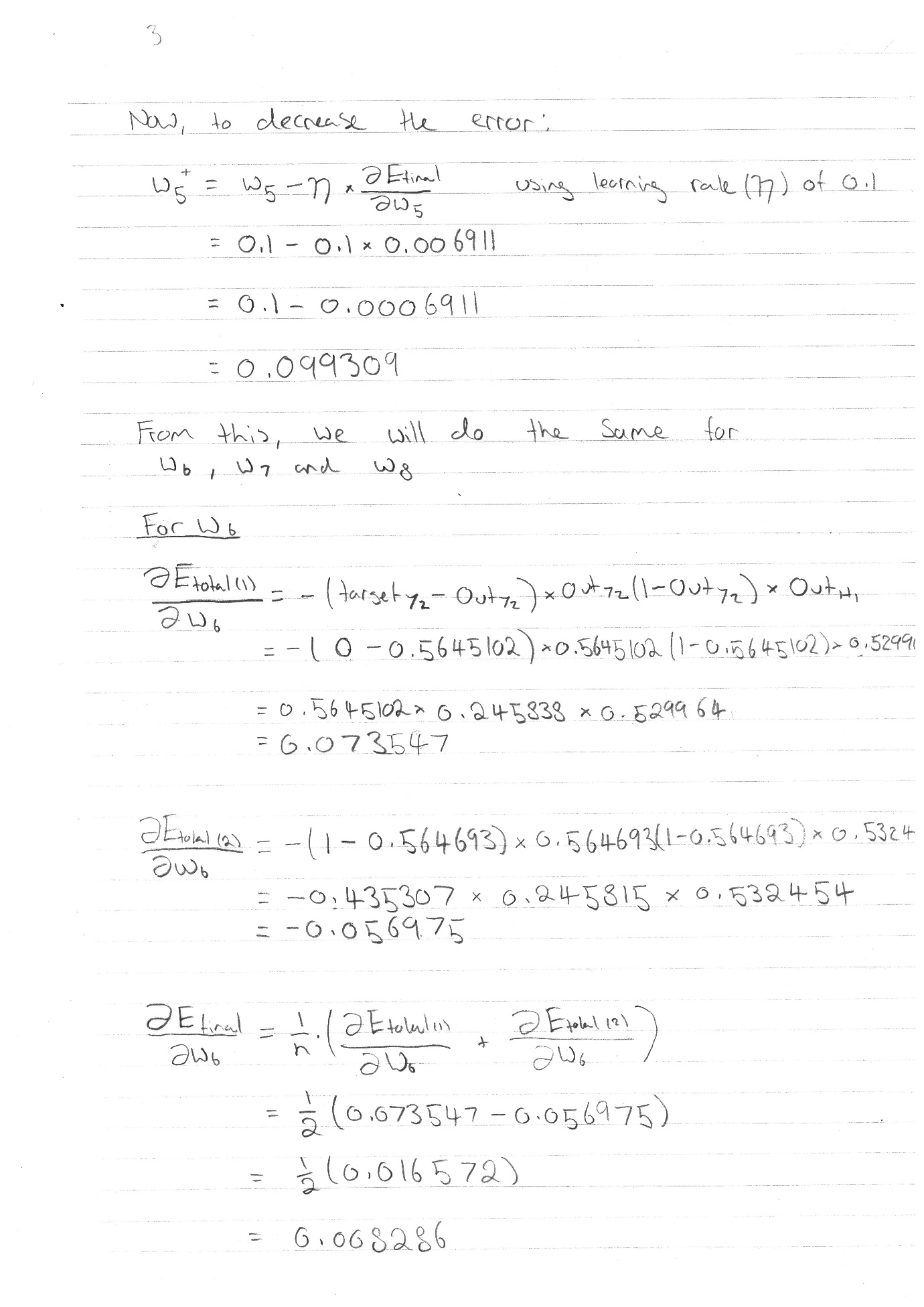
*Figure 1: Manual Neural Network Calculations*

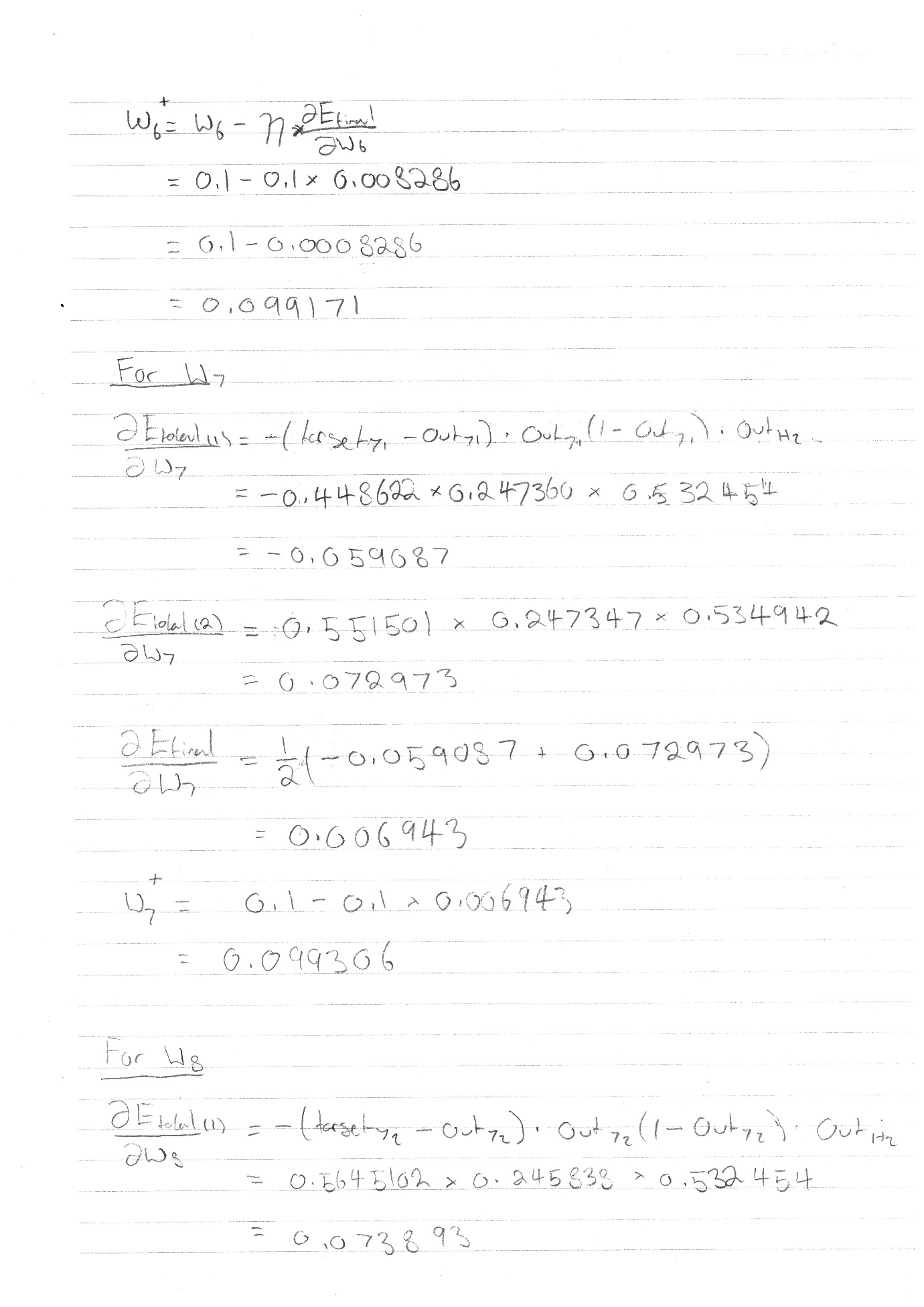
**

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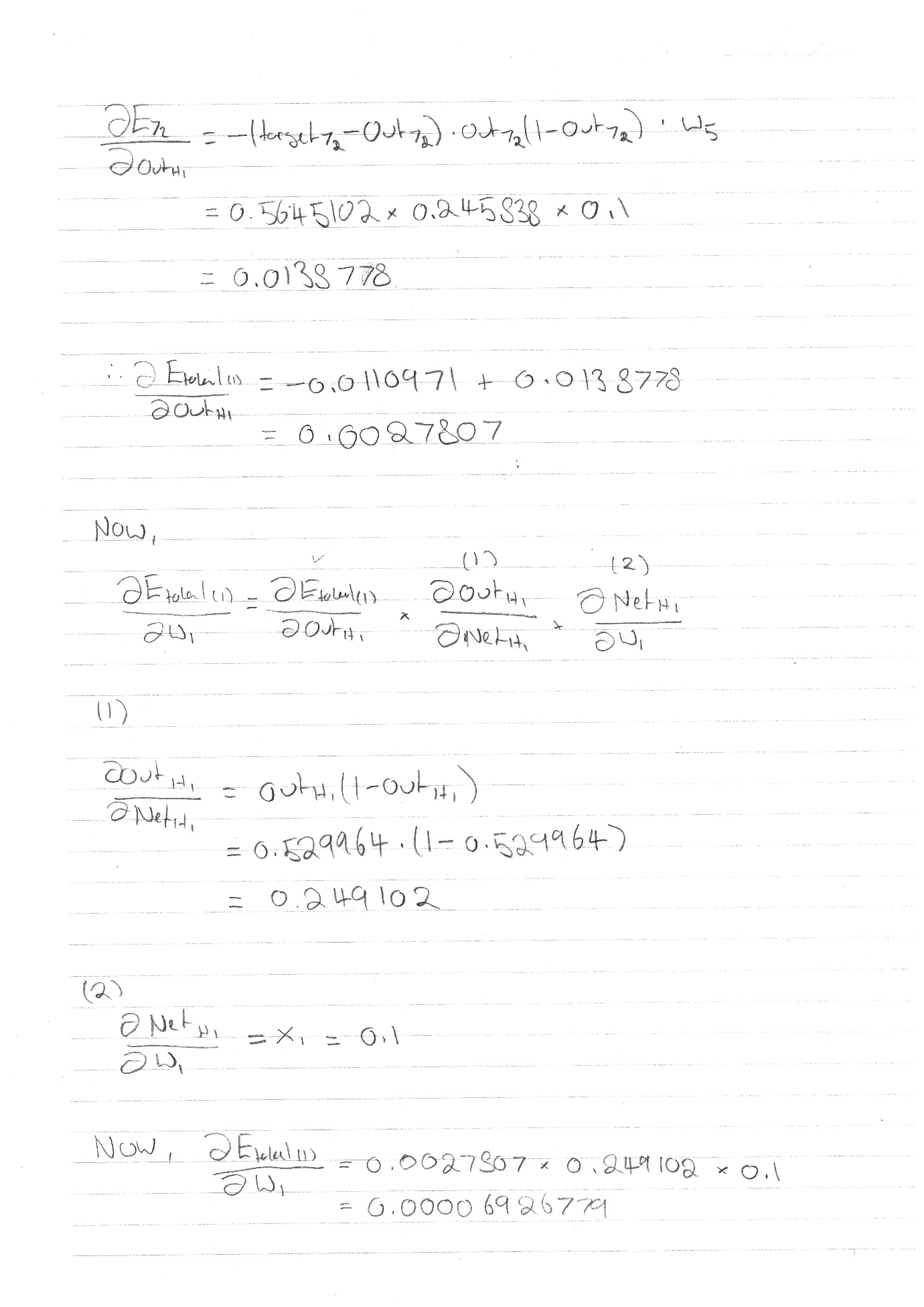
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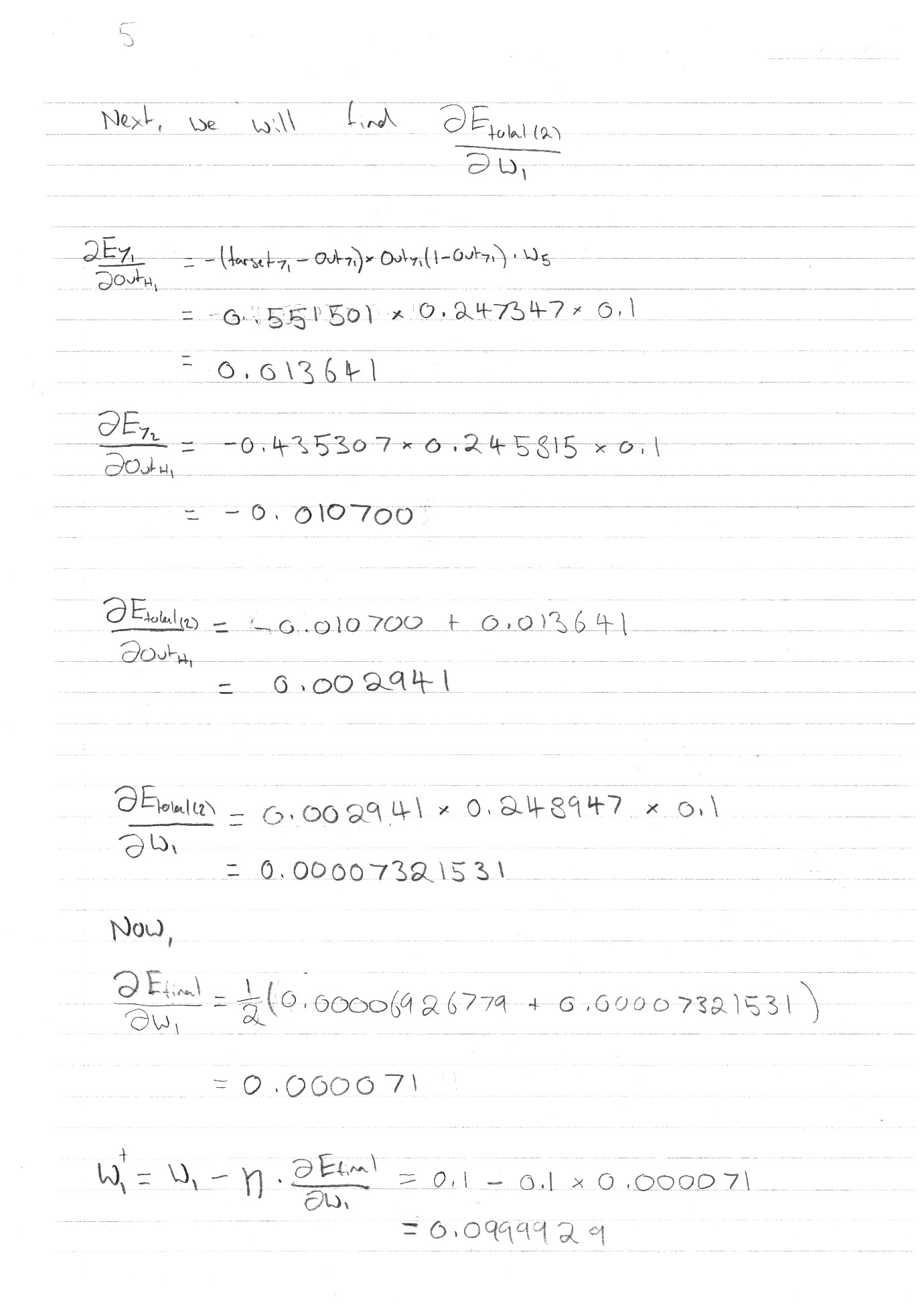
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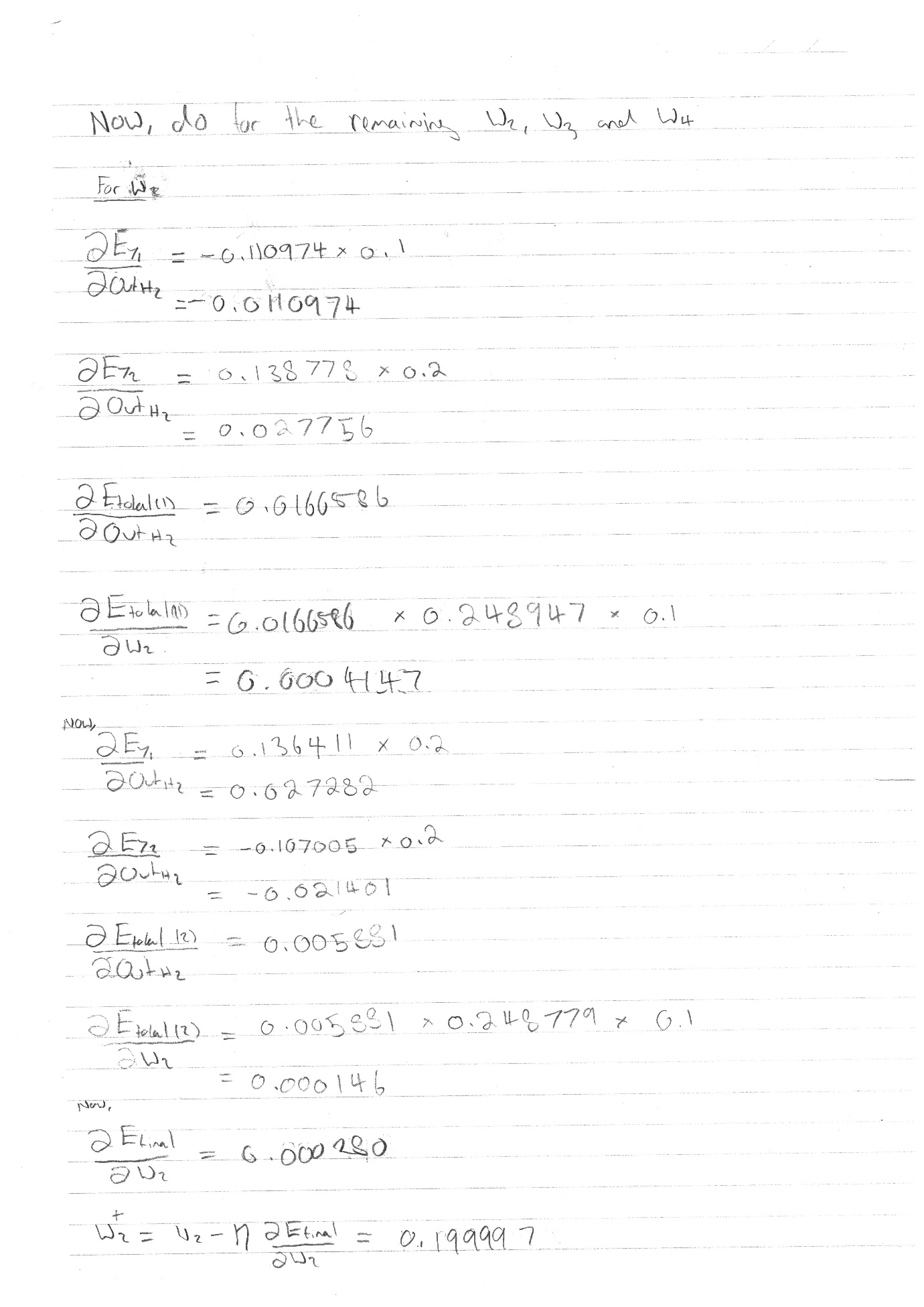
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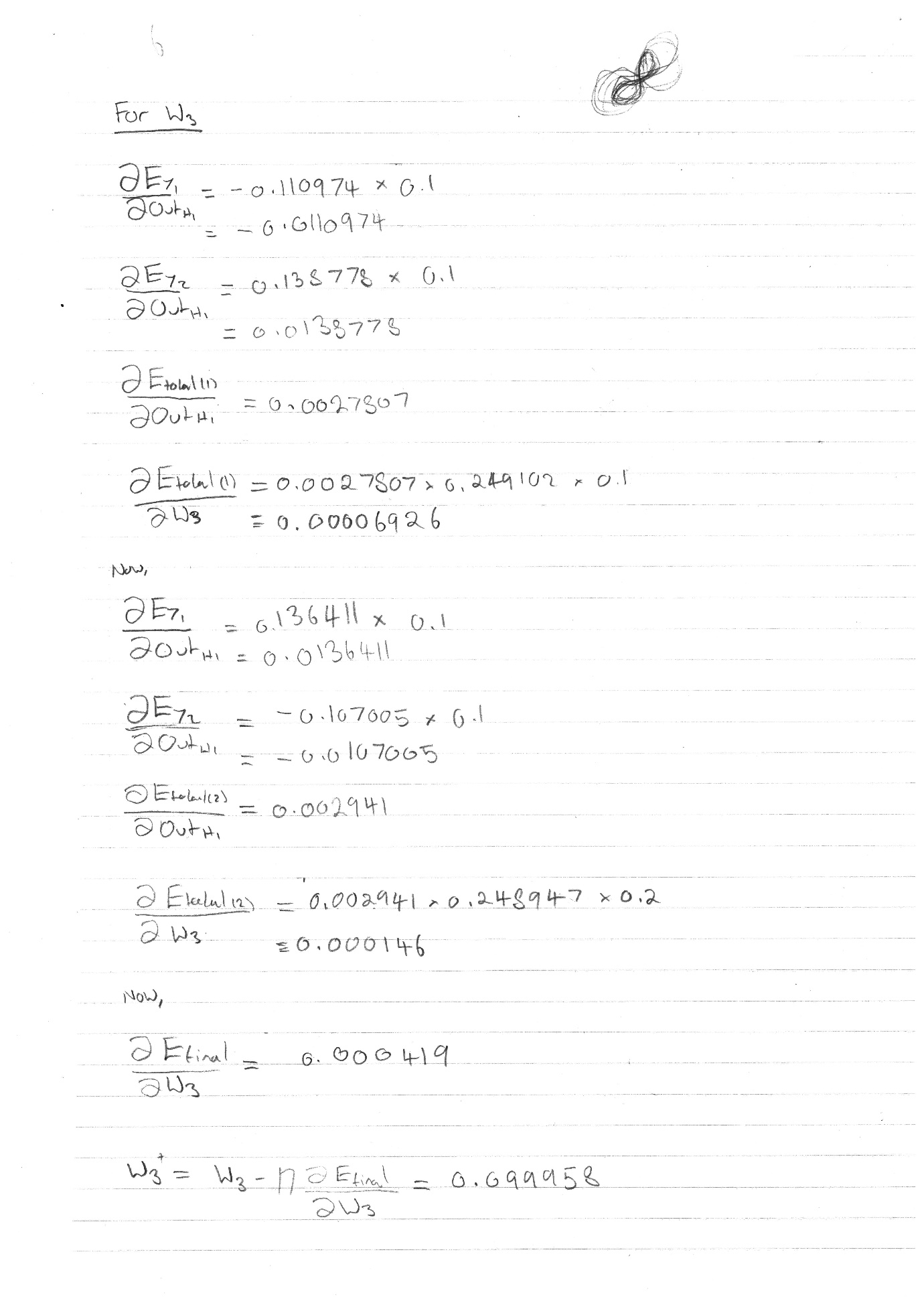
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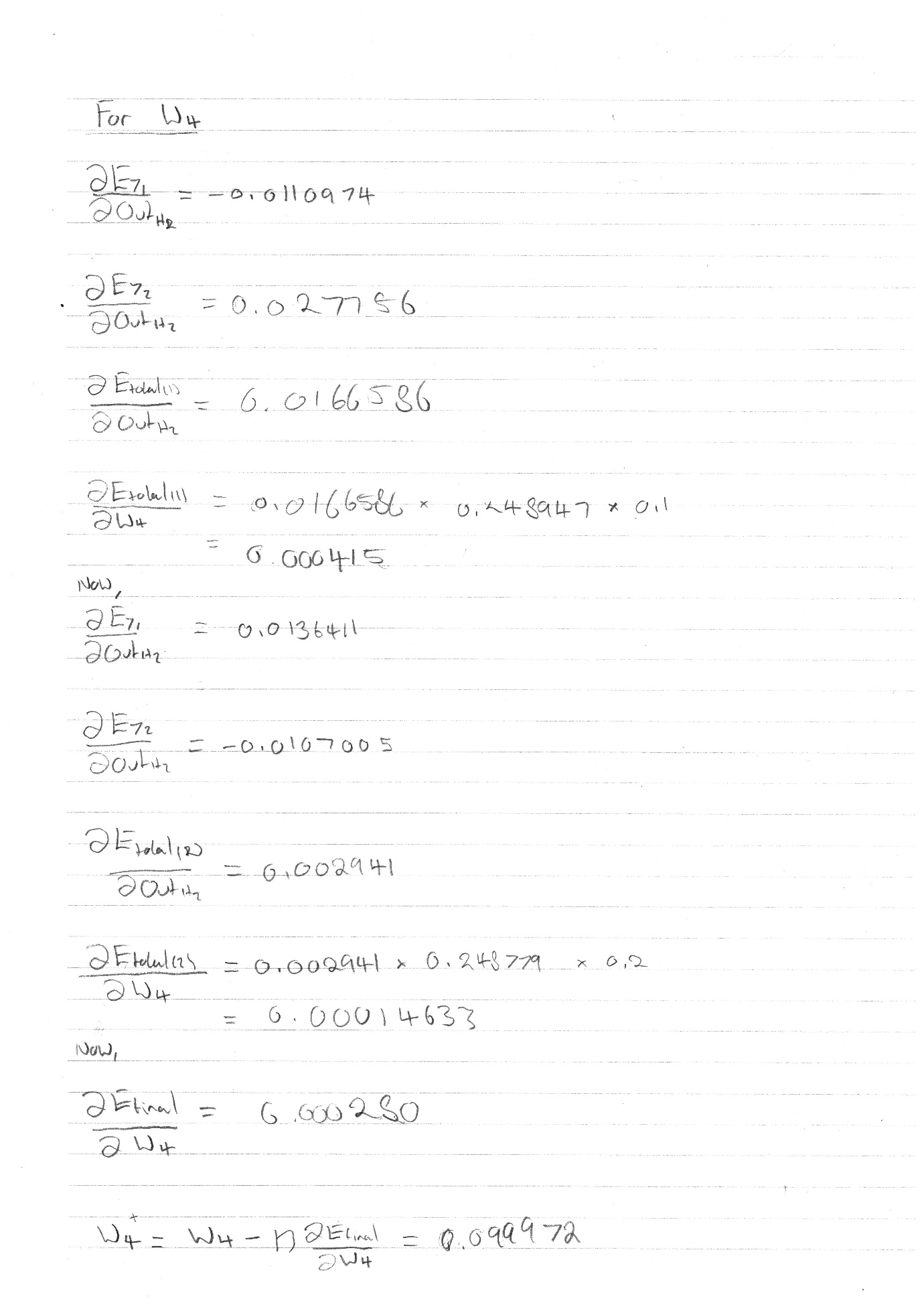
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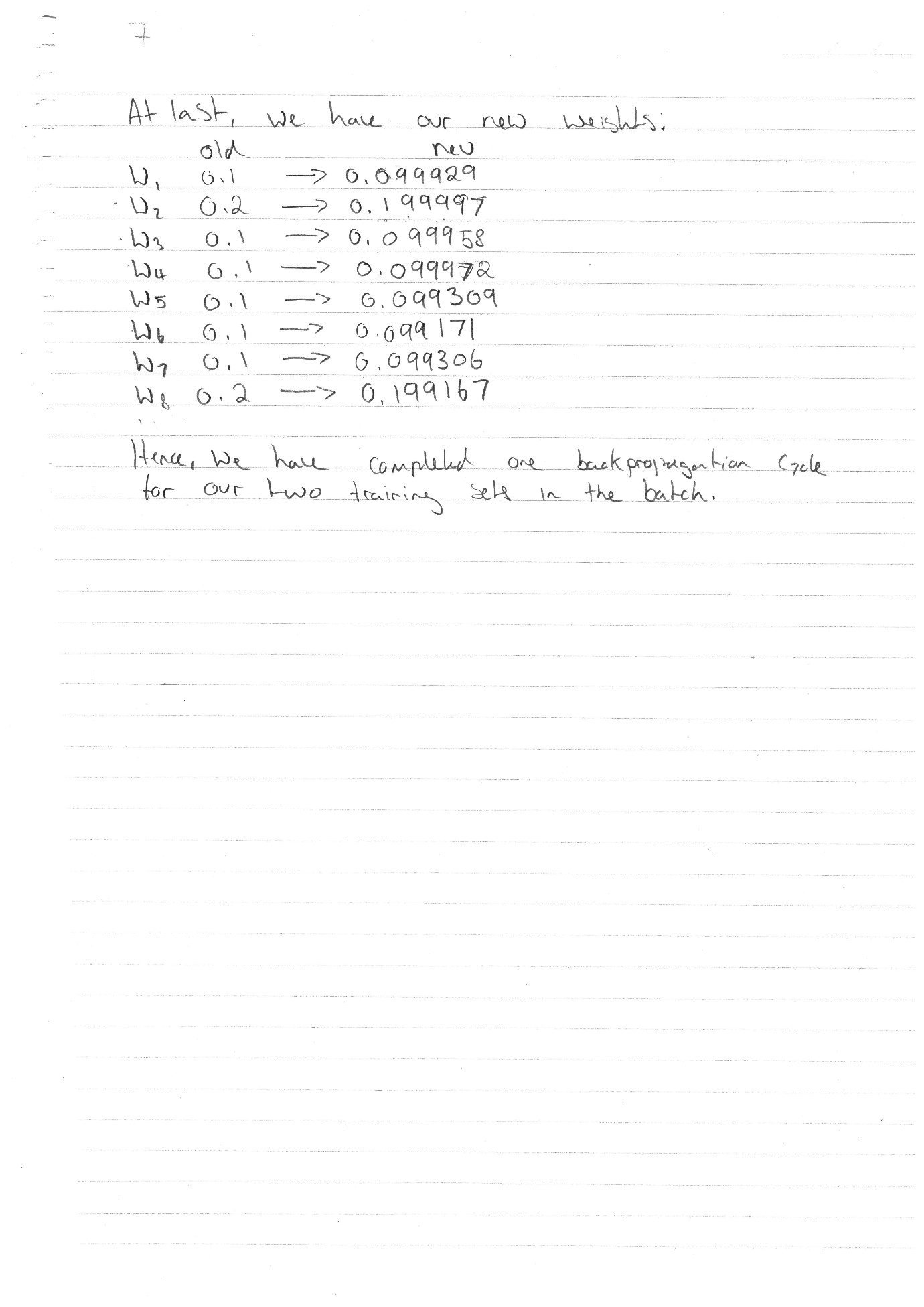
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