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MATHEMATICS WORKSHEET



Machine Learning Mathematics

SCORE

___ / 20

Chapter: Applied Mathematics · Level ★★★ · Time: 30 min

Name _____ Class _____ Date _____

AFTER THIS WORKSHEET YOU CAN

- ✓ Apply the gradient-descent update rule. ✓ Understand the role of the learning rate.
- ✓ Connect loss minimization to training. ✓ Recognise overfitting from train/test gaps.



Section A · Concept Check

• BEGINNER

$4 \times 1 = 4$

- 1** $w = 10$, learning rate 0.2, gradient 5. The update gives:

☐ A. 9 ☐ B. 11 ☐ C. 8 ☐ D. 10.2

3 A learning rate that is too low causes:

☐ A. divergence ☐ B. very slow training

☐ C. instant convergence ☐ D. overfitting

2 $w = 2$, learning rate 0.05, gradient -8. The update gives:

☐ A. 2.4 ☐ B. 1.6 ☐ C. 2.05 ☐ D. -0.4

4 Training aims to ___ the loss function:

☐ A. maximize ☐ B. minimize ☐ C. ignore

☐ D. randomize



Section B · Problem Solving

• INTERMEDIATE

$2 + 3 \times 3 = 11$

- 5** Update rule: $w \leftarrow w - \eta \times$ _____
- 6** $w = 10$, $\eta = 0.2$, gradient 5 $\Rightarrow$ new $w =$ _____
- 7** $w = 10$, learning rate 0.2, gradient 5. Find the updated parameter.
- _____
- 8** $w = 2$, learning rate 0.05, gradient -8. Find the updated parameter.
- _____
- 9** What happens if the learning rate is set too low?
- _____



Section C · Challenge

• CHALLENGE

5

- 10** What is the goal of training in terms of the loss function?
- _____

Reflection — the most useful thing I learned: _____

A ___/4 B ___/11 C ___/5 Total ___/20

Teacher's Signature _____

Parent's Signature _____

✂ ANSWER KEY — FOLD OR CUT BEFORE HANDING OUT

1-A 2-A 3-B 4-B | 5 gradient 6 9 7 = $10 - 1 = 9$ 8 = $2 + 0.4 = 2.4$ 9 = Training becomes very slow | 10 = To minimize the loss

