

# Coursework (1) for *Introductory Lectures on Optimization*

Your name

Your ID

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**Exercise 1.** Please write out the optimization objective function for reinforcement learning.

**Solution of Exercise 1:** bla.bla... bla bla.. bla. □

**Exercise 2.** Is it feasible to use the Uniform Grid method as an optimizer to train a neural network? Why?

**Solution of Exercise 2:** bla.bla... bla bla.. bla. □

**Exercise 3.** For the performance analysis of the Uniform Grid Method, Prove that

$$\left(\left\lfloor \frac{L}{2\epsilon} \right\rfloor + 2\right)^n, \text{ and } \left(\left\lfloor \frac{L}{2\epsilon} \right\rfloor\right)^n,$$

coincide up to an absolute constant multiplicative factor if  $\epsilon \leq O(\frac{L}{n})$ .

**Proof of Exercise 3:** bla.bla... bla bla.. bla. □

**Exercise 4.** Prove that, for any  $\mathbf{x}, \mathbf{y} \in \mathbb{R}^n$ , we have

$$\nabla f(\mathbf{y}) = \nabla f(\mathbf{x}) + \int_0^1 \nabla^2 f(\mathbf{x} + \tau(\mathbf{y} - \mathbf{x}))(\mathbf{y} - \mathbf{x}) d\tau.$$

**Proof of Exercise 4:** bla.bla... bla bla.. bla. □