

CHAPTER I

INTRODUCTION

1.1 Background and Scope

One of the consequences of the ordering property of real numbers is the inequalities. They are usually described as propositions which occur from algebraic manipulations or geometric observations. Although some inequalities trivially occur as the consequences of these observations, like any other propositions in mathematics, the mathematical verification is necessary, which is surprisingly not an easy task in some cases. The proof of such inequalities often requires both knowledge of identities and other known inequalities, while there are some inequalities still remains as open problems nowadays. Thus, the research in inequalities remains popular until today. In the past, the development of the theory of inequalities has been credited to many mathematicians such as Cauchy, Hölder, Jensen, and Schwarz; as we can see some inequalities are named after them.

In applied mathematics, inequalities often related to some optimization problems, financial problems, estimation problems, error analysis, etc. They often used as tools to prove the theorems. Since the types of the problems are varies, we need to state some inequalities mathematically in a general and convenient way. In order to do this, we will state the inequalities in term of functions. As one of the very fundamental object in mathematics, the types of function is also varies. Since we talk about inequalities, we will scope our discussion to the most well known ordered field, real numbers. Thus through this discussion the functions will always referred to functions whose domain are

real numbers. Furthermore, we add other requirement that is the functions must be convex functions; this requirement comes into consideration because usually the observation of the convex functions has lead mathematicians to some nontrivial inequalities.

1.2 Purpose of Writing

The purpose of this writing is to exhibit and study the proof of Classical Hardy-Littlewood-Pólya Inequalities and prove its Riemann integral analog form. The other purpose is to study the proof of Generalized Hardy-Littlewood-Pólya Inequalities based on the paper given in [1] and then prove its Riemann integral form which is stated without proof in [1].

This *skripsi* also provide and prove some examples of known inequalities which can be obtained from the Classical Hardy-Littlewood-Inequalities and its generalization.