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## Abstract

In this paper, we provide continued fraction sequences and other sequences to approximate the median of the gamma distribution. Furthermore, we consider the approximation of the Ramanujan sequence.

## 1 Introduction

Let  $n \geq 0$  be an integer and  $X_n$  be a random variable having the  $\Gamma(n+1, 1)$  distribution. The median of  $X_n$ , denoted by  $\lambda_n$ , is the unique solution of

$$P\{X_n \leq \lambda_n\} = \frac{1}{n!} \int_0^{\lambda_n} e^{-t} t^n dt = \frac{1}{2}.$$

In recent years, many papers have appeared providing interesting properties of  $\lambda_n$ . Choi [1] provided the asymptotic formula

$$(1.1) \quad \lambda_n = n + \frac{2}{3} + \frac{8}{405n} - \frac{64}{5103n^2} + \frac{2944}{492075n^3} + O\left(\frac{1}{n^4}\right),$$

and he showed that there is a connection between  $\lambda_n$  and the Ramanujan sequence

$$(1.2) \quad \theta_n = \frac{n!}{n^n} \left( \frac{1}{2} e^n - \sum_{k=0}^{n-1} \frac{n^k}{k!} \right).$$

Adell and Jodrá [2] proved that

$$(1.3) \quad n + \frac{2}{3} + \sum_{i=1}^6 \frac{a_i}{n^i} < \lambda_n < n + \frac{2}{3} + \sum_{i=1}^7 \frac{a_i}{n^i},$$

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