

Exercise 1. Prove that

$$\sum_{n \leq x} \frac{\log n}{n} = \frac{1}{2} \log^2 x + O(1).$$

Exercise 2. p 70, # 2

Exercise 3. Prove that for any $k \in \mathbb{N}$ and any $s > 0, s \neq 1$

$$\sum_{\substack{n \leq x \\ (n,k)=1}} \frac{1}{n^s} = \frac{\varphi(k)}{k} \frac{x^{1-s}}{1-s} + \zeta(s) \prod_{p|k} (1 - p^{-s}) + O(x^{-s}).$$

On what does the implied constant in the error term depend?