

Distribution of the Prime Numbers

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It is known that there are infinitely many prime numbers and, by the Prime Number Theorem, we can count very accurately how many primes are in the interval $[0, N]$ when N is a large integer. As it turns out, answers to more subtle questions about the distribution of the prime numbers are, for the most part, still open. In this talk, we will consider the following problem: Let p be a large prime, how large do we have to choose an integer h to ensure that the interval $(p, p+h]$ contains an additional prime? We will show that this problem is far from resolved, even assuming the truth of the Riemann Hypothesis! We will discuss a probability model (due to H. Cramer) for the primes that suggests the correct size of h . If there is time, we will discuss how precise knowledge of the behavior of the zeros of the Riemann zeta-function could lead to a satisfying (partial) solution.