

MA 330 HOMEWORK
DUE FRIDAY, FEB 8

In this assignment, we will look at another proof that there are infinitely many primes. Consider the following theorem, first proved by Euler in the 1700's.

Theorem A: Let $\mathbb{P} := \{2, 3, 5, 7, \dots\}$ denote the set of prime numbers. The infinite series $\sum_{p \in \mathbb{P}} \frac{1}{p}$ is divergent, i.e.

$$\frac{1}{2} + \frac{1}{3} + \frac{1}{5} + \frac{1}{7} + \dots = \infty.$$

I) Show that Theorem A implies there are infinitely many primes.

II) Look at the great theorems on page 196 in Chapter 8 and page 215 of Chapter 9 of *Journey Through Genius*. Compare and contrast these two theorems with theorem A above. Do any of them imply the others? Which theorem is your favorite?

Part II should be typed, and the equivalent of 1 full page in 12 point Times New Roman font.