MATH 437 HOMEWORK 10 : NINA CHALGERI

① There are infinitely many primes.

PROOF. (By contradiction)

- Suppose there are only a finite number of primes, n.
- Each called:

$$p_1, p_2, \dots, p_n$$

- Let $P = p_1 p_2 p_3 \cdots p_n + 1$
- When dividing P by each $p_1, p_2, \dots, p_n$ we get a remainder of 1.
- This means that P is either prime and larger than p_n or P is divisible by a prime larger than p_n which is a contradiction
- Therefore there are infinite primes.

②

	2	3	5	7	
1s					19
10s	11	13		17	
20s		23			29
30s	31			37	
40s	41	43		47	
50s		53			59
60s	61			67	
70s	71	73			79
80s		83			89
90s				97	
100s	101	103		107	109
110s		113			
120s				127	
130s	131			137	139

$\sqrt{140} \approx 11.8$

STEPS:

(1) Get rid of all evens except 2

(2) get rid of 2, 4, 6, 8, 10 columns

(3) get rid of multiples of 3

(4) get rid of multiples of 5

(5) get rid of multiples of 7

(6) get rid of multiples of 11

③

3003

$3\overline{)3003} = 1001$

$7\overline{)1001} = 143$

$11\overline{)143} = 13$

$13\overline{)13} = 1$

$3^1 \cdot 7^1 \cdot 11^1 \cdot 13^1$

④