MTH 385 2022-03-28 Worksheet

Exercise 1. *Who was Pierre de Fermat and when did he live?*

Exercise 2. *State Fermat's Little Theorem.*

Exercise 3. *Let p be prime and let k be an integer strictly between 0 and p. Prove $\binom{p}{k}$ is divisible by p.*

Exercise 4. *Let p be prime. Prove $2^p - 2$ is divisible by p.*

Exercise 5. *Define the* multinomial coefficient $\binom{n}{k_1, k_2, \ldots, k_m}$.

Exercise 6 (5.9.1)**.** *Use the result $2^p = (1+1)^p = 2 +$ terms divisible by p, and its method of proof, to show that*

$$3^p = (2+1)^p = 3 + \text{ terms divisible by } p.$$

Exercise 7 (5.9.2)**.** *Build on the idea of Exercise 5.9.1 to show that $n^p - n$ is divisible by p for any positive integer n.*

Exercise 8 (5.9.3)**.** *Observe the terms divisible by p in the first few rows of Pascal's triangle, computed in the previous section.*