

**Questions:**

1. **Determine whether 227 and 79 are relatively prime.** (10 points)
2. **Find the multiplicative inverse of 79 mod 229.** (10 points)
3. **Without calculating anything, by simply looking at the numbers, can you tell whether 7932 has a multiplicative inverse mod 11958? Explain your solution.** (10 points)
4. **Show the steps of how to calculate  $\phi(315)$ .** (20 points)
5. **Calculate  $227^{54996213} \bmod 21$  as efficient as possible.** (20 points)
6. **Determine whether the following groups are cyclic. If they are, give a generator of the group.** (30 points)
  - $(\mathbb{Z}_5, +)$  (i.e., the set of numbers modulo 5 with addition as the group operation)
  - $(\mathbb{Z}_8^*, \times)$