

Name (print): _____ Signature: _____

You have 30 minutes. Show your work. Notes not allowed! Problems are on both sides of this sheet.

Problem 1. (5 pts) Find the prime number factorizations of 990, 2772, and of the least common multiple of 990 and 2772.

Problem 2. (5 pts) Find the remainder when 3^{663} is divided by 7.

Problem 3. (5 pts) Prove that $6^{n+1} + 5 \cdot 3^n - 1$ is divisible by 10 for every natural number n .

Problem 4. (5 pts) Suppose that $a \equiv b \pmod{m}$ and $c \equiv d \pmod{m}$. Prove the following two statements:

- $a + c \equiv b + d \pmod{m}$,
- $ac \equiv bd \pmod{m}$.