Name: _____

Directions: Show all work. No credit for answers without work.

1. [**5 points**] Solve the following system of congruences; your solution should identify the set of all possible solutions.

$$x \equiv 23 \pmod{31} \qquad 2x \equiv 43 \pmod{53} \qquad x \equiv 6 \pmod{25}$$

2. [**4 points**] Convert the following system of coungruences to an equivalent system of congruences with prime power moduli. (Do not solve.)

$$x \equiv 58 \pmod{98} \qquad x \equiv 16 \pmod{21} \qquad x \equiv 16 \pmod{36}$$

3. [**1 point**] Without using CRT, show that if $x = 9r + 5$ and $x = 7s + 3$ for $r, s \in \mathbb{Z}$, then $x = 63n + 59$ for some $n \in \mathbb{Z}$.