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) Let a,b, and c be integers. Prove that if $c|a$ and $c|b$, then $c|ax + by$ for any integers x and y.

Problem 2. (5 pts) Add and multiply $(1121)_3$ and $(201)_3$ together in base 3.

Problem 3. (5 pts) Find all the integer solutions to the Diophantine equation $7x + 9y = 1$.

Problem 4. (5 pts) Let a, b be integers. Suppose that $d = \gcd(a, b) \neq 0$. Prove that $\gcd\left(\dfrac{a}{d}, \dfrac{b}{d}\right) = 1$.