

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 and b be positive integers. Prove that if $a|b$ and $b|a$ then $a = b$.

Problem 5. (5 pts) Convert 5 and 24 to base 3, multiply them in base 3, then convert the product back to base 10.

Problem 3. (5 pts) Find the greatest common divisor of 6^{11} and 10^7 .

Problem 4. (5 pts) Find all pairs of nonnegative integers x and y solving the Diophantine equation

$$126x - 75y = 6.$$

Extra: (3 pts) For any integers a and b , show that $\gcd(a, b) = \gcd(a, a + b)$.

Extra: (3 pts) Prove or disprove: if a, b are integers and $\gcd(a, b) = d$ then $\gcd(a + b, a - b) = d$.