

Math 55 Section Worksheet

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Office Hours: Wed 10-12pm, Evans 775

February 7, 2018

1 Warm-up

1. What is the definition of $\gcd(a, b)$?
2. What is the definition of *relatively prime*?
3. State Bezout's Theorem.

2 Problems

1. What is the base 3 expansion of 172?
2. Evaluate the following:
 - (a) $(19^2 \bmod 41) \bmod 9$
 - (b) $(32^3 \bmod 13)^2 \bmod 11$
 - (c) $(7^3 \bmod 23)^2 \bmod 31$
 - (d) $(21^2 \bmod 15)^3 \bmod 22$
3. Calculate $\gcd(224, 126)$. Write the gcd as a linear combination of 224 and 126.
4. Let $a, b, c, m \in \mathbb{Z}$. Prove that if $a \equiv b \pmod{m}$, then $ac \equiv bc \pmod{m}$. Is it true that if $ac \equiv bc \pmod{m}$, then $a \equiv b \pmod{m}$?

3 Extra

5. Let $a, b, c \in \mathbb{Z}$ such that $a^2 + b^2 = c^2$. Prove that at least one of a, b is even. (Hint: Look at $c^2 \bmod 4$).
6. Let A be a palindromic positive integer with an even number of digits. For example, A could be 403,304. Prove that A is divisible by 11. (Hint: write A out in base 10 expansion).