

MATH 115, SUMMER 2012
QUIZ 3

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There are problems on the back of this page, 20 points total. Write clearly and in complete sentences. If you need extra paper, ask me.

(1) (8 points) Find all solutions to the congruence $x^3 + 8x - 5 \equiv 0 \pmod{5^3}$.

(2) (3 points) Let a be a unit in the ring $\mathbb{Z}/18$. What are all the possible values of the order of a ?

(3) (2 points) If g is a primitive root mod 11, what is the order of g^4 mod 11?

(4) (2 points) Find the order of the element 7 in $\mathbb{Z}/9$.

(5) (1 point each) True or False. No justification necessary.

(a) If $a^6 \equiv -1 \pmod{13}$, then a is a primitive root mod 13.

(b) If $f(x) \equiv 0 \pmod{p}$ has exactly three solutions, then $f(x) \equiv 0 \pmod{p^2}$ has at least three solutions.

(c) If $m > 1$ is odd, then every congruence $f(x) \equiv 0 \pmod{m}$ has at least one solution mod m .

(d) If g is a primitive root mod p , then $g^{(p-1)(p-2)/2} \equiv -1 \pmod{p}$.

(e) There are $\phi(11)$ primitive roots mod 12.