Übungen zu Vertiefung Elementare Zahlentheorie

WS 2010/2011, Blatt 9

Aufgabe 33. Which of the following integers have primitive roots? (You may use the general result that was given without complete proof.)

(a) $198, 199, 200, 201, 202, 203$;

(b) $10198, 10199, 10200, 10201, 10202, 10203$.

Aufgabe 34. Determine in each case the number of solutions:

(a) $x^7 \equiv 45 \pmod{97}$;

(b) $x^8 \equiv 45 \pmod{97}$;

(c) $x^9 \equiv 45 \pmod{97}$.

You may use the following information: 5 is a primitive root modulo 97, and $\mathrm{ind}_5 45 = 45$.

Aufgabe 35. (a) Determine all primitive roots modulo 31.

(b) Determine all integers of order 6 modulo 31.

Aufgabe 36. Reduce the following congruences to the form $x^2 \equiv a \pmod{p}$:

(a) $4x^2 + 2x + 1 \equiv 0 \pmod{5}$;

(b) $3x^2 - x + 5 \equiv 0 \pmod{7}$;

(c) $2x^2 + 7x - 10 \equiv 0 \pmod{11}$;

(d) $x^2 + x - 1 \equiv 0 \pmod{13}$.

Abgabe bis Freitag, 17.12.2010, 12:00 Uhr