

86578708 (4)

$$= \{9, 19, 16, 20, 25, 8, 10, 28, 4, 5, 14, 18, 7, 13\}$$

$$= \{1, 2, 4, 5, 7, 8, 9, 10, 14, 16, 18, 19, 20, 25, 28\}$$

$$T = \{3, 3^3, 3^5, 3^7, 3^9, 3^{11}, 3^{13}, 3^{15}, 3^{17}, 3^{19}, 3^{21}, 3^{23}, 3^{25}, 3^{27}, 3^{29}\}$$

(Reduced mod 31)

$$= \{3, 27, 26, 17, 29, 13, 24, 30, 22, 12, 15, 11, 6, 23, 21\}$$

$$= \{3, 6, 11, 12, 13, 15, 17, 21, 22, 23, 24, 26, 27, 29, 30\}$$

iv) Working mod 3 (since $111 = 3 \times 37$) ✓

$$f(x) = 7x^2 + 29x + 18 \equiv x^2 + 2x \pmod{3}$$

$$x=0 \quad f(0) = 0^2 + 2 \times 0 = 0 \equiv 0 \pmod{3}$$

$$1 \quad f(1) = 1^2 + 2 = 3 \equiv 0 \pmod{3}$$

$$2 \quad f(2) = 2^2 + 2 \times 2 = 8 \equiv 2 \pmod{3}$$

$\Rightarrow x=0, 1$ are solutions mod 3 ✓

2 solns
found
37

time

have

found

both

solns

since

f has

degree 2

$$f(x) = 7x^2 + 29x + 18 \pmod{37}$$

$$f(0) = 18 \pmod{37}$$

$$f(1) = 7 \times 1^2 + 29 \times 1 + 18 = 54 \equiv 17 \pmod{37}$$

$$f(2) = 7 \times 2^2 + 29 \times 2 + 18 = 104 \equiv 30 \pmod{37}$$

$$f(3) = 7 \times 3^2 + 29 \times 3 + 18 = 168 \equiv 20 \pmod{37}$$

$$f(4) = 7 \times 4^2 + 29 \times 4 + 18 = 246 \equiv 24 \pmod{37}$$

$$f(5) = 7 \times 5^2 + 29 \times 5 + 18 = 338 \equiv 5 \pmod{37}$$

$$f(6) = 7 \times 6^2 + 29 \times 6 + 18 = 444 \equiv 0 \pmod{37}$$

$$f(7) = 7 \times 7^2 + 29 \times 7 + 18 = 564 \equiv 9 \pmod{37}$$

$$f(8) = 7 \times 8^2 + 29 \times 8 + 18 = 698 \equiv 32 \pmod{37}$$

$$f(9) = 7 \times 9^2 + 29 \times 9 + 18 = 846 \equiv 32 \pmod{37}$$

$$f(10) = 7 \times 10^2 + 29 \times 10 + 18 = 1008 \equiv 9 \pmod{37}$$

$$f(11) = 7 \times 11^2 + 29 \times 11 + 18 = 1184 \equiv 0 \pmod{37}$$

$$f(12) = 7 \times 12^2 + 29 \times 12 + 18 = 1374 \equiv 5 \pmod{37}$$

$$f(13) = 7 \times 13^2 + 29 \times 13 + 18 = 1578 \equiv 24 \pmod{37}$$

$$f(14) = 7 \times 14^2 + 29 \times 14 + 18 = 1796 \equiv 20 \pmod{37}$$

$$f(15) = 7 \times 15^2 + 29 \times 15 + 18 = 2028 \equiv 30 \pmod{37}$$

$$f(16) = 7 \times 16^2 + 29 \times 16 + 18 = 2274 \equiv 17 \pmod{37}$$

P.T.O.