12.- The repunits with an even number of digits.
19.- Let $a = (a_n a_{n-1} \ldots a_0)_10$ then $a = \sum_{i=0}^{n} a_i 10^i \equiv a_0 + a_1 10 + a_2 100 + 1000(a_3 + a_4 10 + a_5 100) + \ldots \equiv (a_0 a_1 a_2) + (a_3 a_4 a_5) + \ldots \mod 37$ Therefore $a$ is divisible by 37 iff $(a_0 a_1 a_2) + (a_3 a_4 a_5) + \ldots$ is divisible by 37. Using this test we get that 443, 692 $\equiv 443 + 692 \equiv 1135 \equiv 0 \mod 37$ and 11, 092, 785 $\equiv 11 + 92 + 785 \equiv 88 \equiv 0 \mod 37$
22.- Since 88 = 11 · 8 we must have 8 $|$ x42y therefore 8 $|$ 42y therefore $y = 4$ since 11 $|$ x424 we must have 11 $|$ 4−2+4−x i.e. 11 $|$ 6−x. Therefore $x = 6$

Section 5.5

8.- a) 5 $\mod 10$
   b) Let $(x_i)_{10}$ be the correct id and $(y_i)_{10}$ be the id with a single error. Then $(x_i)_{10} - (y_i)_{10} \equiv a(x_k - y_k) \mod 10$ with $a$ being either 3, 7 or 9. Since 3, 7 and 9 are units modulo 10 a single error can always be detected.
   c) A transposition which are not detected are the transpositions of digits $x_i$ and $x_j$ such that $i \mid j \mod 3$ or $x_i \equiv x_j \mod 5$
12.- a) 7 b) 9 c) 7
13.- 0 $- 07 - 289905 = 0$
16.- a) 2 b) 4 c) 3 d) 7
17.- Let $(x_i)_{10}$ be the correct UPC code and $(y_i)_{10}$ be the UPC code with a single transposition. Then $(x_i)_{10} - (y_i)_{10} \equiv a(x_k - y_k) \mod 10$ where $a$ is either 3 or 1. Since 1 and 3 are units modulo 10 a single transposition can always be detected.