Dis Math Homework week 8

Problem 1

a) 19 div by 7, quot: 2, rem: 5

b) q: 11, rem: 0

c)
$$\begin{array}{r|l} 789 & 23 \\ \hline 69 & 34 - q \\ \hline 99 & \\ 92 & \\ \hline 7 & \text{rem} \end{array}$$

d)
$$\begin{array}{r|l} 1001 & 13 \\ \hline 91 & 77 - q \\ \hline 91 & \\ \hline 0 & \text{rem} \end{array}$$

e)
$$\begin{array}{r|l} 0 & 19 \\ \hline 19 & 0 - q \\ \hline & \text{rem} \end{array}$$

f) $3 \mid \frac{3}{0} - q$

3 — rem

g) $-1 \mid \frac{3}{0} - q$

-1 — rem

h) $4 \mid \frac{4}{4} - q$

0 — rem

Problem 2

?

Problem 3

a) $ac \equiv bc \pmod{m}$, $m \geq 2$

$a \equiv b \pmod{m}$

Let $m = 4$

$c = 7$

$b = 2$

$a = 0$

$0 \cdot 2 \not\equiv 2 \cdot 2 \pmod{4}$

b) If $a \equiv b \pmod{m}$ and $c \equiv d \pmod{m}$

$a^c \equiv b^d \pmod{m}$

$m = 5$

$b = 3$

$a = 3$

$c = 1$

$d = 6$

$3^1 \not\equiv 3^6 \pmod{m}$

$3 \not\equiv 729 \pmod{m}$

Problem 4

Show that if a, b, k and m are integers such that $k \geq 1$, $m \geq 2$ and $a \equiv b \pmod{m}$, then $a^k \equiv b^k \pmod{m}$

$k = 1$

$a^1 \equiv b^1 \pmod{m}$

$a^2 \equiv b^2 \pmod{m}$

$a^k \equiv b^k \pmod{m}$

Problem 5 !

Problem 6

Problem 6

Problem 7

a) 231 | 2
230 | 115 | 2
1 | 114 | 57 | 2
1 | 56 | 28 | 2
0 | 28 | 14 | 2
0 | 14 | 7 | 2
0 | 6 | 3 | 2
1 | 2 | 1 | 2
1 | 0

11100111

b) 4532 | 2
4532 | 2266 | 2
0 | 2260 | 1133 | 2
0 | 1132 | 566 | 2
1 | 566 | 283
0

Problem 8

a) $(1111)_2 = 1 \cdot 2^0 + 1 \cdot 2^1 + 1 \cdot 2^2 + 1 \cdot 2^3 + 1 \cdot 2^4$

$= 1 + 2 + 4 + 8 + 16 + 32 = 63$

b) $1000000001 = 1 \cdot 2^0 + \ldots + 1 \cdot 2^9 =$

Problem 9

a)
$$\begin{array}{r} 1000111 \\ 1110111 \\ \hline 10111110 \end{array}$$

b)
$$\begin{array}{r} 1110111 \\ 1011101 \\ \hline 11010100 \end{array}$$

Problem 10

a) $88 = 2 \cdot 11 \cdot 2 \cdot 2 = 2^3 \cdot 11$

b) $A1C = 1 \cdot 4 \cdot 4 = 2 \cdot 7^2 = 12C$

Problem 11

100!

$1 \cdot 2 \cdot 3 \cdot \ldots \cdot 99 \cdot 100$

Problem 12

a) $\gcd(12, 18) = 2$

b) $\gcd(111, 201) = \gcd = (111, 90) = (90, 21)$

$201 = 111 \cdot 1 + 90$ $= (21, 6) = (6, 3)$

$111 = 90 \cdot 1 + 21$ $21 = 6 \cdot 3 + 3$

$90 = 21 \cdot 4 + 6$

$\gcd(111, 201) = 3$