Problem 1: Use the Θ-notation to determine the rate of growth of the following functions:

Function	big-Θ estimate
$5n + 3n^4 + 3$	$\Theta(n^4)$
$n \log^2 n + n^{1.5} + \sqrt{n}$	$\Theta(n^{1.5})$
$17\sqrt{n} + n3^n \log n + 4^n$	$\Theta(4^n)$
$\sqrt{n} + 11 \log^5 n$	$\Theta(\sqrt{n})$
$1 + 1/\log n$	$\Theta(1)$

Problem 2: (a) Give the greatest common divisor of 900 and 168. Show your work.

$900 = 2^2 \cdot 3^2 \cdot 5^2$ and $168 = 2 \cdot 3 \cdot 7$, so the greatest common divisor is $2^2 \cdot 3 = 12$. You can also compute it using Euclid's algorithm.

(b) Let $a = 2^9 \cdot 3^2 \cdot 7 \cdot 11^3$ and $b = 2^2 \cdot 3^5 \cdot 7^6$. Give the greatest common divisor of a, b. Justify briefly your answer.

Choosing common factors in the factorizations, we obtain that the greatest common divisor is $2^2 \cdot 3^2 \cdot 7 = 252$.

(c) Compute $8^{-1} \pmod{13}$. Show your work.

We list consecutive multiples of 13 plus 1, until we find a multiple of 8: 1, 14, 27, 40. Since $40 = 8 \cdot 5$, we get $8^{-1} = 5 \pmod{13}$.

(d) Solve $4x = 11 \pmod{17}$. Show your work.

We first find $4^{-1} \pmod{17}$. Listing multiples of 17 plus 1, we get 1, 18, 35, 52. Since $52 = 4 \cdot 13$, we obtain $4^{-1} = 13 \pmod{17}$. So $x = 11 \cdot 13 = 7 \pmod{17}$.

Problem 3: Give the multiplication table modulo 7 (only upper-right triangle):

$\times$	1	2	3	4	5	6
1	1	2	3	4	5	6
2	-	4	6	1	3	5
3	-	-	2	5	1	4
4	-	-	-	2	6	3
5	-	-	-	-	4	2
6	-	-	-	-	-	1

(b) Give the inverses modulo 7 of all numbers $1, 2, ..., 6$:

x	1	2	3	4	5	6
x^{-1}	1	4	5	2	3	6