Homework 2

Problem 1:

Compare, with proof, the asymptotic behavior of the following pairs of functions in n.

(a) $(\log(n))^2$ and $\sqrt{n}$
(b) $\exp(n)$ and 2^n
(c) $\dfrac{n^2 + 1}{n + 5}$ and $3n$.

Problem 2:

What is the total number of placements of 8 queens on a chess-board with 64 fields. The only condition is that the queens are in different squares.

Problem 3:

In a Sudoku puzzle, we have a three-by-three grid of three-by-three grids. Each of the smaller grids contains at the end all numbers between 1 and 9. Give, with explanation, a formula for the total number of ways to place the nine different digits in a matrix of size 3×3. Give the total number of possible ways of writing the nine digits in each of the sub-grids, irrespectively

of whether two digits appear in the same row or column. Also give the number of digits in this number.

Problem 4:

Show all steps of the Euclidean algorithm to calculate $\gcd(779625000, 330115500)$. Hint: You can use computers.