
Challenge Exercise 1
MATH 1271/3071 – 2012
Due Date: Oct 19, 2012

These challenge exercises ask you questions about material covered in class, but at a greater depth. You are not required to do this exercise; it is intended as extra work. However, you will receive extra credit if you complete the problem correctly.

When handing this assignment in, please clearly label your work as a Challenge Exercise. Make sure to include your name.

Problem 1. [5pts] Use mathematical induction to prove that 24 divides $n^4 - 6n^3 + 23n^2 - 18n$ for all $n \geq 1$.

Problem 2. [5pts] The **depth** of a circuit is defined by specifying that the depth of the initial input is 0, and if a gate has n different inputs at depths d_1, \dots, d_n , respectively, then its outputs have depth equal to $\max\{d_1, \dots, d_n\} + 1$. The depth of a circuit is the maximum depth of the gates in a circuit.

(a) What is the depth of the circuit of Exercise 17 of Section 3.4 on page 92.

(b) Compute the depth of a *full adder* (on page 90).