Universität des Saarlandes
FR 6.2 - Informatik
Prof. Dr. W.J. Paul
Dipl.-Ing. Christoph Baumann

Exercise Sheet 2
Computer Architecture II
(Due: Nov 8th, 2011)

Exercise 1: (Significand Rounding) **(4+2 Points)**
Assume a real number x with an IEEE-normal factoring (s, e, f) such that $s = 1$, $f \in [1, 2)$ and $x = [\![s, e, f]\!]$. Let $x_1 = [\![s, e, f_1]\!]$ with $f_1 = sigrd_u(s, f)$. Show for

a) $|x| \leq X_{max}$

b) $|x| > X_{max}$

that the significand rounding works correctly:

$$x_1 = \begin{cases} r(x) & : \quad |x| \leq X_{max} \\ \hat{r}(x) & : \quad |x| > X_{max} \end{cases}$$

Exercise 2: (Wrapped Exponents) **(2+2+2+2 Points)**
Let $\alpha = 3 \cdot 2^{n-2}$ and $a, b \in \mathcal{R}$.

a) Show for $x = a/b$ and $b \neq 0$ that the following statements hold!

- $OVF(x) \Rightarrow 2^{e_{min}} < |x \cdot 2^{-\alpha}| < X_{max}$
- $UNF(x) \Rightarrow 2^{e_{min}} < |x \cdot 2^{\alpha}| < X_{max}$

b) Show the same for $x = a + b$ and $x = a - b$

Exercise 3: (TINY & LOSS) **(3+3 Points)**
In the lecture we argued that the following two implications hold:

$$LOSS_a(x) \Rightarrow LOSS_b(x)$$
$$TINY_a(x) \Rightarrow TINY_b(x)$$

To be proven or disproven:

$$LOSS_a(x) \Leftarrow LOSS_b(x)$$
$$TINY_a(x) \Leftarrow TINY_b(x)$$