

Computer Architecture II - WS 08/09  
Exercise Sheet 2 (due: 10.11.08)

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**Exercise 1: ( $\alpha$ -Equivalence Properties)** (10 points)

Let  $x, x' \in \mathbb{R}$ ,  $\alpha \in \mathbb{Z}$ , and  $x =_{\alpha} x'$ , you need to prove the following properties:

1.  $-x =_{\alpha} -x'$  and  $[-x]_{\alpha} = -[x]_{\alpha}$  (Mirroring)
2.  $2^e \cdot x =_{\alpha-e} 2^e \cdot x'$  and  $[2^e \cdot x]_{\alpha-e} = 2^e \cdot [x]_{\alpha}$  (Scaling)
3. Let  $y = q \cdot 2^{-\alpha}$  then  $x + y =_{\alpha} x' + y$  (Translation)
4. Let  $\beta < \alpha$  then  $x =_{\beta} x'$  (Refinement)

**Exercise 2: (Rounding Theory)** (5 points)

Let  $\eta(x) = (s, e, f)$  and  $r$  be an IEEE rounding mode, you need to prove that:

1.  $r(x) = r([x]_{p-e})$
2.  $\eta([x]_{p-e}) = (s, e, [f]_p)$
3.  $x =_{p-e} x' \Rightarrow r(x) = r(x')$