

IEEE 754 Notes

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Pre IEEE 754 Examples

- Most: $x \neq y$ and $x - y = 0$
- $\frac{x}{\sqrt{x*x+y*y}} > 1$ on older Crays for some x, y .
- Overflow if $1.0 * x$, x large but not largest value
- $1.0 * x$ loses terminal 4 bits
- Multiplication less accurate than addition (Cray)
e.g. : : last 3 bits unreliable

Identities (exact computations)

1. $x = -y$

2. $2^N * x, 2^{-N} * x, N \in \mathbb{N}$

3. $x * y = x * y = y * x$

4. $x + y = x + y = y + x$

5. $x - y = x + (-y) = -(y - x)$

6. $\min(x, y) \leq \frac{x+y}{2} \leq \max(x, y)$

7. $\frac{1}{2} \leq \frac{x}{y} \leq 2 \Rightarrow x - y \text{ is exact}$

8. $x = N * y, N \in \mathbb{Z} \Rightarrow \frac{x}{y} = N$

9. $\{a \leq c, b \leq d\} \Rightarrow a + b \leq c + d$

10. $\{0 \leq a \leq c, 0 \leq b \leq d\} \Rightarrow a * b \leq c * d$

11. $\pm\infty + x = \pm\infty$

12. $\pm\infty * x = \pm\infty$

13. $\frac{x}{\pm\infty} = \pm 0$

14. $\frac{\pm\infty}{x} = \pm\infty$

15. $(x + y) + z \neq x + (y + z)$

16. lexicographic ordering