Slow Quiz #1
Numerical Functional Analysis

Præparatus supervivet

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Uppsala, May, 2019

1. Why are metric spaces not so often used in numerical analysis? Why are, e.g., inner product spaces much more common?

2. If x is an exact quantity and $\tilde{x}$ is an approximation to x, what is the error; $e = x - \tilde{x}$, or $e = \tilde{x} - x$? Does it matter? How does this *sign convention* define the term 'residual'?

3. We attempt to build a normed space out of a metric space as follows. Take any metric space (X, d) and define $\|x\| := d(x, 0)$. -Are there any problems with this attempt or do we obtain a normed space?

4. On a conference you meet a mathematician M. M says: *"...have not understood the topology of this space..."*. Seriously, what is actually meant by this? Does it have anything to do with topological spaces or is it just buzz?

5. An iterative procedure for solving $F(x) = y$ produces a sequence $(x_n)_{n \geq 1}$. Suppose both the domain and the range of F can be turned into suitable metric spaces (D, d_x) and (R, d_F). When should the iteration stop? When $d_x(x_n, x_{n+1}) \leq TOL$ or when $d_F(F(x_n), y) \leq TOL$? Or is there some kind of clever combination?