

# A Simple Mathematics Article

CHRISTOPHER MABB

ROGER HUNTER

ABSTRACT. This article illustrates many features of a mathematics article. We include all of the basic structural elements of a document, such as front matter, numbered sections, cross references and a bibliography. We do not announce proofs of Macdonald's constant term conjectures for the affine root systems  $S(F_4)$  and  $S(F_4)^\nu$ , nor do we explain the spurious appearance of the formula  $(\nabla \times \mathbf{F}) \cdot \mathbf{k} = z + 1$  in this abstract.

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### 1. MATHEMATICS AND TEXT

Let  $H$  be a Hilbert space,  $C$  be a closed bounded convex subset of  $H$ ,  $T$  a non-expansive self map of  $C$ . Suppose that as  $n \rightarrow \infty$ ,  $a_{n,k} \rightarrow 0$  for each  $k$ , and  $\gamma_n = \sum_{k=0}^{\infty} (a_{n,k+1} - a_{n,k})^+ \rightarrow 0$ . Then for each  $x$  in  $C$ ,  $A_n x = \sum_{k=0}^{\infty} a_{n,k} T^k x$  converges weakly to a fixed point of  $T[1]$ .

### 2. IN-LINE AND DISPLAYED MATHEMATICS

The expression  $\sum_{i=1}^{\infty} a_i$  is in-line mathematics, while

$$\sum_{i=1}^{\infty} a_i$$

is displayed. Consider the numbered equation

$$u_{tt} - \Delta u + u^5 + u|u|^{p-2} = 0 \text{ in } \mathbb{R}^3 \times [0, \infty). \quad (1)$$

We seek solutions in all space, despite the non-linearity of Eqn.1.

### 3. THEOREMS, LEMMAS, ETC.

You can automatically number theorems and other proclamations.<sup>1</sup>

**Theorem 1.** *Suppose  $u_0 \in C^3(\mathbb{R}^3)$ ,  $u_1 \in C^2(\mathbb{R}^3)$  have finite energy*

$$\int_{\mathbb{R}^3} \left( \frac{|u_1|^2 + |\nabla u_0|^2}{2} + \frac{|u_0|^6}{6} \right) dx < \infty$$

*and suppose the solution  $u^{(0)}$  to the homogeneous wave equation with initial data  $u_0, u_1$  is uniformly bounded. Then there exists  $\epsilon_0 > 0$  such that for  $|\epsilon| < \epsilon_0$ , the initial value problem (1) with data  $\epsilon u_0, \epsilon u_1$  admits a global  $C^2$ -solution.*

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<sup>1</sup>Such as propositions, lemmas, and corollaries

**Proposition 2.** If  $ax^2 + bx + c = 0$ , then  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ .

**Corollary 3.** If  $b^2 - 4ac < 0$ , then  $x$  cannot be real.

**Example 4.** If  $x^2 - 4 = 0$ , then  $x = \pm 2$ .

#### 4. MATRICES AND OTHER DEVICES

We saw how to state Theorem 1 in section 3. Now try your hand at  $\sqrt{\sin^2 \theta + \cos^2 \theta} = 1$ , then  $\begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix}$ .

#### REFERENCES

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- [3] W.P. Thurston, *Geometry and topology of three manifolds*, Lecture notes, Princeton Univ., NJ, 1979.