

Learning Notation

1 Welcome

Welcome to the [shared Overleaf project](#) for our Learning Notation seminars! Our seminars are held biweekly for economics masters students at Uppsala University to discuss mathematics and other topics in an informal environment.

Some topics that we might cover are:

- Set theory and proof techniques
- Topics in real analysis or advanced calculus
- Topics in probability theory
- Complex numbers and geometry
- Topics in linear algebra
- Differential equations

The motivation of the seminars is to not to cover or explore any particular topic sufficiently in depth, but to expose our willing participants to ideas and discussions in mathematics without the stress and obligations of an academic class, and—perhaps most importantly—to develop an [appreciation](#) of the rigour and beauty of mathematical proofs.

2 How to use LaTeX

[Overleaf](#) has great resources for learning how to use LaTeX. This section will also give you a quick primer on using math notation with LaTeX.

Using the `mathtools` package, We can write single-line equations like so:

$$e^{i\pi} + 1 = 0. \tag{1}$$

If we don't want the line numbers, we can write like so:

$$a^2 + b^2 = c^2.$$

We can also write multi-line equations.

$$f(x) = ax^n \implies f'(x) = anx^{n-1} \tag{2}$$

$$\implies f''(x) = an(n-1)x^{n-2}. \tag{3}$$

Again if we don't want the line numbers, we can write

$$\begin{aligned} ax^2 + bx + c = 0 &\implies x^2 + px + q = 0, \quad p = \frac{b}{a}, \quad q = \frac{c}{a} \\ &\implies x^2 + px = -q \\ &\implies x^2 + px + \left(\frac{p}{2}\right)^2 = -q + \left(\frac{p}{2}\right)^2 \\ &\implies \left(x + \frac{p}{2}\right)^2 = \frac{p^2}{4} - q \\ &\implies x + \frac{p}{2} = \pm \sqrt{\frac{p^2}{4} - q} \\ &\implies x = -\frac{p}{2} \pm \sqrt{\frac{p^2}{4} - q}. \end{aligned}$$

We can also write math notation in-text as well. For example, $\pi = 3.14159\dots = 4 \int_0^1 \sqrt{1-x^2} \, dx$.

There's a lot to know, but a lot of it is just a quick Google away.