LaTeX to PDF and MathJax: Example 1

## LaTeX to PDF and MathJax: Example 1

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2017

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This is an example of a document compiled from LATEX  into multiple formats:

* [Standard print PDF](https://stem-enable.github.io/LaTeXtoPDFandMathJax-Example1/LaTeXtoPDFandMathJax-1-standard.pdf)
* [Clearer print PDF](https://stem-enable.github.io/LaTeXtoPDFandMathJax-Example1/LaTeXtoPDFandMathJax-1-clear.pdf)
* [Accessible web format](https://stem-enable.github.io/LaTeXtoPDFandMathJax-Example1/)
* [Accessible Word document](https://stem-enable.github.io/LaTeXtoPDFandMathJax-Example1/LaTeXtoPDFandMathJax-1.docx)

The outputs can be used to test setups and as a first example for students to try out.

### 1 [Quadratic equations](#QQ2-1-5)

A quadratic equation is an equation with the form $ax^{2}+bx+c=0$ where $x$ represents an unknown and $a$, $b$ and $c$ are known numbers with $a\ne 0$.

#### 1.1 [Solutions to a quadratic equation](#QQ2-1-6)

A solution to a quadratic equation is a value of $x$ such that the equation balances. The solutions to quadratic equations can be found by using the quadratic formula:

|  |  |
| --- | --- |
| $$x=\frac{−b\pm \sqrt{b^{2}−4ac}}{2a}.$$ | (1) |

 Example.
For instance, the solutions to $x^{2}+2x−3=0$ are:

$$\begin{matrix}x&=\frac{−2\pm \sqrt{2^{2}−4×1×−3}}{2×1}  &&  \\ &=\frac{−2\pm \sqrt{4+12}}{2}  &&  \\ &=\frac{−2\pm \sqrt{16}}{2}  &&  \\ &=\frac{−2\pm 4}{2}  &&  \end{matrix}$$

Hence, $x=1$ or $x=−3$.

#### 1.2 [The discriminant](#QQ2-1-7)

 Definition (Discriminant).
The discriminant of a quadratic equation with coefficients $a,b,c\in R$ is:

$$Δ=b^{2}−4ac.$$

 Remark.
Note that this is the expression beneath the square root symbol in the quadratic formula ([1](#x1-6001r1)).

We can use the discriminant to determine the number of real roots of a quadratic equation. The number depends on the value of $Δ$ as in table [1](#x1-70011).

|  |  |
| --- | --- |
|  |  |
| Value of $Δ$ | Real roots |
|  |  |
| $Δ>0$ | Two, distinct |
| $Δ=0$ | One, repeated |
| $Δ<0$ | Zero |
|  |  |
|  |  |

Table 1: Number of real roots of a quadratic equation, given the discriminant

Figure [1](#x1-70031) shows an example of each possibility[1](#fn1x0).



Figure 1: Examples of quadratic functions with zero, one and two real roots.

[1](#fn1x0-bk)The image is due to Olin, CC-BY-AS 3.0 downloaded from [Wikimedia Commons](https://commons.wikimedia.org/wiki/File%3AQuadratic_eq_discriminant.svg)