Abstract

This is a showcase of PreTeXt features. It is meant to be viewed in multiple output forms (HTML, PDF) to demonstrate what is possible from PreTeXt source.

1 Mathematics

1.1 The Quadratic Formula

There is a derivation of the quadratic formula that avoids using fractions until the very end. Suppose that we have an equation \( ax^2 + bx + c = 0 \), where \( a \neq 0 \). Since \( 4a \) is also not equal to 0, we may multiply each side of the equation by \( 4a \) and not lose any information:

\[
4a^2 x^2 + 4abx + 4ac = 0
\]

Subtract \( 4ac \) from each side:

\[
4a^2 x^2 + 4abx = -4ac
\]

Complete the square on the left side by adding \( b^2 \) to each side:

\[
4a^2 x^2 + 4abx + b^2 = b^2 - 4ac
\]

\[
(2ax + b)^2 = b^2 - 4ac
\]

\[
|2ax + b| = \sqrt{b^2 - 4ac}
\]

\[
2ax + b = \pm \sqrt{b^2 - 4ac}
\]

\[
2ax = -b \pm \sqrt{b^2 - 4ac}
\]

Since \( a \neq 0 \), we may divide by \( 2a \) on each side:

\[
x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}
\]

And this is the famous quadratic formula.
1.2 Some Amusing Identities

These equations are amusing, although maybe only to mathematicians. Largely taken from math.stackexchange.com\(^1\).

\[ \sqrt[3]{2} = 2^{\sqrt{2}} \]
\[ 2592 = 2^5 \cdot 9^2 \]
\[ \sqrt{2025} = 20 + 25 \]
\[ \sum_{n=1}^{\infty} \frac{1}{n^n} = \int_0^1 \frac{1}{x^x} \, dx \]
\[ 3^3 + 4^4 + 5^5 = 3435 \]
\[ \int_{-\infty}^{\infty} \frac{\sin x}{x} \, dx = \int_{-\infty}^{\infty} \frac{\sin^2 x}{x^2} \, dx \]
\[ \log(1 + 2 + 3) = \log(1) + \log(2) + \log(3) \]
\[ \int_0^{\infty} \frac{1}{1 + x^2} \frac{1}{1 + x^8} \, dx = \int_0^{\infty} \frac{1}{1 + x^2} \frac{1}{1 + x^4} \, dx \]

2 Images and Diagrams from \LaTeX\ Code

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{example_tikz}
\caption{TikZ Examples}
\end{figure}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{example_pgfplots}
\caption{pgfplots Examples}
\end{figure}

\(^1\text{math.stackexchange.com/questions/505367/surprising-identities-equations}\)
Figure 2.3 \texttt{pstricks} Examples

Entries are alphabetized word-by-word, not letter-by-letter. Topics indexed are \LaTeX{} features, not any actual content.
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## Colophon

This article was authored in, and produced with, PreTeXt. It is typeset with the Latin Modern font.