Sample document using LaTeX

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Linear algebra is a **pivotal** tool in 100% of mathematics. A couple applications of linear algebra include:

1. Quantum mechanics
2. Web search engine algorithms

An $m \times n$ real-valued matrix M can be viewed as a function from $\mathbb{R}^n$ to $\mathbb{R}^m$. In this context, we call M a *matrix function*. For example, take $m = 2$ and $n = 10$. If $x \in \mathbb{R}^{10}$, $y = Mx$ is a vector in $\mathbb{R}^2$. Similar statements carry over when working over $\mathbb{N}$, $\mathbb{Z}$, $\mathbb{Q}$, or $\mathbb{C}$. (There is a feudal war over whether $\mathbb{N}$ should be $\{n \in \mathbb{Z} : n \geq 0\}$ or $\{n \in \mathbb{Z} : n > 0\}$.)

Let $D \subseteq X$. Recall that a function $f : D \to Y$ between Banach spaces has a limit L at $x_0 \in X$ if $\forall \epsilon > 0, \exists \delta$ such that $|x - x_0| < \delta \Rightarrow |f(x) - L| < \epsilon$. In this case, we write

$$\lim_{x \to x_0} f(x) = L$$

A function f is continuous at $x_0 \in X$ if f is defined at x_0 and the limit of f at x_0 is $f(x_0)$.

Theorem 0.1. *An $m \times n$ matrix function M is continuous at all $x_0 \in \mathbb{R}^n$.*

Proof. Obvious. □

Sums, integrals, and derivatives

Now, we move on to some harder analysis.

$$\sum_{n=1}^{\infty} \frac{1}{n^2} = \frac{\pi^2}{6} \tag{1}$$

The statement of (1) is known as Basel's problem. It is well-known that

$$\int_{-1}^{1} x^3 \, dx = 0$$

Table 1: Trigonometric values

$theta$	$\cos\theta$	$\sin\theta$
0	1	0
$\pi/4$	$\sqrt{2}/2$	$\sqrt{2}/2$
$\pi/2$	0	1
π	-1	0

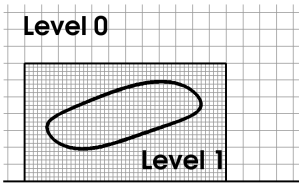

Figure 1: This figure shows an example of adaptice mesh refinement (amr).

Note, however, that if $g(x) = \sin x$, then $\frac{d}{dx}g(x) = \cos(x)$. This is also sometimes denoted $\frac{dg}{dx}$ or $g'(x)$. As an exercise[1], compute $\frac{d}{dx}[\ln(3^{(\sec^9 x)}) - x^2 e \log_{11} x]$.

Tables and figures

Sometimes data needs to be displayed in a table or figure. A good example may be trigonometric data. See Table . Figures are entered with the includegraphics command. A figure showing an AMR setup can be seen in Figure . Note: LaTeXdecides where to put figures and tables.

[1] Hint, use the Chain Rule!