My Title

Author names, alphabetical by last name

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Abstract

Include your original abstract, but edit it so it matches the paper you have written.

1 Introduction

For our class we use the book [1]. Explain here some background details and give motivation.

2 Body

2.1 First subsection

Write your interesting content here. Give a theorem or two. Write a complete proof in full detail with proper grammar and normal paragraph/paper formatting.

Definition 2.1. An $n \times n$ matrix A is *invertible* if there is an $n \times n$ matrix A' such that $AA' = I_n$ and $A'A = I_n$ where I_n is the $n \times n$ identity matrix.

Theorem 2.1. *Let A be an invertible $n \times n$ matrix. Then the only solution to the system $A\vec{x} = \vec{0}$ is the trivial solution.*

Proof. Let A be an invertible $n \times n$ matrix. This means that there is an $n \times n$ matrix, A', such that $AA' = A'A = I$. Assume that $\vec{x}$ is a solution to the homogeneous system, that is $A\vec{x} = \vec{0}$. Therefore,

$$\begin{array}{rcll}
\vec{x} & = & I\vec{x} & \text{(Multiplication by } I\text{)} \\
 & = & (A'A)\vec{x} & (A'A = I) \\
 & = & A'(A\vec{x}) & \text{(Associativity)} \\
 & = & A'\vec{0} & \text{(Substitution } A\vec{x} = \vec{0}\text{)} \\
 & = & \vec{0} & \text{(Multiplication by } \vec{0}\text{)}
\end{array}$$

Thus $\vec{x} = \vec{0}$ is the only solution to $A\vec{x} = \vec{0}$. □

2.2 Second Subsection

Subsections are not necessary but may be useful.

3 Examples

Give an example of using your topic now. I will give some examples of how to use LaTeX.

New paragraphs come from skipping a line. Without the line between no new paragraph is started. Equations:

$$A\vec{x} = \vec{b} \tag{1}$$

Equation Array:

$$A(\vec{x} + \vec{y}) = A\vec{x} + A\vec{y} \tag{2}$$
$$= \vec{b} + \vec{b} \tag{3}$$
$$= 2\vec{b} \tag{4}$$

Remark. To have equations or equation arrays that are not numbered use `equation*` or `eqnarray*`.

Example 3.1. For a table you specify the alignment of each column and use a `|` for vertical borders

Spot 11	Spot 12	Spot 13
Spot 21		Spot 23
Entry 31		

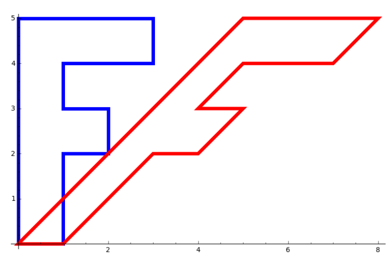

Figure 1: Using linear algebra to italicize a letter

We have included Figure 1 to see how computer graphics might be using linear algebra. Or maybe it was to see how to include a figure into a LaTeXfile.

A Some Sage/Matlab/Other Code

If you use any Sage or other code, include it in an appendix with appropriate comments. This does not count toward your 3-5 pages. Single line Sage code, which could be included during earlier pieces of the paper, can be included using the `\verb` command as follows,

```
sage: A = matrix([[1,0],[0,1]])
```

The Sage code used to create figure 1 is below.

```
# First we write down all of the corners of the letter F
corners=[[0,0],[1,0],[1,2],[2,2],[2,3],[1,3],[1,4],[3,4],[3,5],[0,5],[0,0]]

# Create the polygon that is the letter F
F = polygon2d(corners, fill = False, thickness = 5, color = 'blue')

# Create the transformation matrix
A = matrix([[1,1],[0,1]])
# Create a matrix whose columns are the vertices
vertex_matrix = matrix(corners).transpose()
# Multiply these matrices to get a matrix whose columns are the image of
# the original corners under the A transformation
transformed_corners = A*(vertex_matrix)

# To make the polygon that is the transformed F we must return the 2
# dimensional columns to the rows via transpose.
transformed_F = polygon2d(transformed_corners.transpose(), fill = False,
thickness = 5, color = 'red')

# We can show the two F's together using
# (F+transformed_F).show()
# I chose to be a little fancier in doing it by setting the tick marks
# and the x,y ranges.
(F+transformed_F).show(xmin = -10, xmax = 10, ymin = -6, ymax = 6,
ticks = [range(-10,11),range(-6,7)])
```

References

[1] Larson, Ron, *Elementary Linear Algebra, 7th edition*, Brooks/Cole, Cengage Learning, 2013.

[2] Sage Developers. *SageMath, the Sage Mathematics Software System (Version 8.9)*, 2019.