\usepackage{amsmath}

\usepackage{amsfonts}

\usepackage{amssymb}

\usepackage[makeroom]{cancel}

\usepackage{siunitx}

**First, deriving the matrix form of the Rodrigues' rotation formula**

**1.**

Assuming is the axis of rotation and is the vector being rotated by angle .

I have explained before how to derive the formula in the following form:

**2.**

We can note that . We can also note that . From which we can note,

We can take further note that

Plugging all these facts in we get:

Factoring out and multiplying by to maintain matrix form we get where

**3.**

Now we will note that:

Where:

To which we can note that since is a unit vector which can be rearranged and plugged in above in the diagonal elements.

We’ll now take this revelation and plug it into our matrix.

**Finding the axis and angle from a rotation matrix**

**1.**

when we expand we can note that the sum of the diagonal elements (the trace) are independent of the rotation axis (unaffected by ).

Once again using the fact that we can simplify the diagonal: