MTH 309 - Activity 6
One-to-one and Onto

1. Go back to Activity 5, and determine which of the linear transformations from that activity are 1-1 and which are onto.

2. Consider the following linear transformation.

   A. Rotation in $\mathbb{R}^2$ by θ radians counterclockwise about the origin.

   B. Reflection in $\mathbb{R}^2$ across the line spanned by the vector $\mathbf{v}$.

   C. Projection of $\mathbb{R}^3$ onto $\mathbb{R}^2$.

   D. Inclusion of $\mathbb{R}^2$ in $\mathbb{R}^3$.

   Without doing any calculations, decide which you believe are 1-1 and which you believe are onto. Be sure to explain your reasoning.

3. Find matrix representations for each transformation above.

4. Determine which transformations are 1-1 and which are onto. How well does this coincide with your intuition from problem 2.