Math 360 – Abstract Algebra – Assignment 3

1. Remember that one of our earliest examples of a group was D_4, which has 8 elements. We described the eight elements of this group as e, $R_{90,\ 180}$, etc. To visualize each element of a group, we used a 2-sided square with the numbers 1, 2, 3, and 4 written in the corners clockwise (from the front). We know now, that we can imagine D_4 as a subgroup of the 24-element group S_4. Write each of the eight elements as a permutation. So, for instance, you could write

$$e = \left(\begin{array}{cccc} 1 & 2 & 3 & 4 \\ 1 & 2 & 3 & 4 \end{array} \right).$$

Or, you can use a different notation, if you like.

2. Let $f : A \to B$ and $g : B \to C$.

a) If $g \circ f$ is injective, prove that f is injective.

b) If $g \circ f$ is injective, must g be injective? Either give a proof, or provide a counterexample.