MS121 Discrete Mathematics, Tutorial 8

1. Suppose $f(x) = (-x + 3)/(2x + 1)$. What is the natural domain of f? What is the range of f? Show that $f(x)$ is bijective as a function from its natural domain to its range and compute the inverse function.

2. Let $h = g \circ f \circ g$ where $f : \mathbb{R} \to \mathbb{Z}$ is the floor function and $g : \mathbb{R} \to \mathbb{R} : x \mapsto -x$. Compute $h(3.4)$, $h(7)$, $h(-1.3)$. Describe what h is doing to a general real number x.

3. (a) Suppose $f : A \to B$ and $g : B \to C$ are both one-to-one. Show that the composition $g \circ f : A \to C$ is also one-to-one.
(b) Suppose $f : A \to B$ and $g : B \to C$ are both onto. Show that the composition $g \circ f : A \to C$ is also onto.

4. Show that in any set of 4 integers at least two have the same remainder when divided by 3.

5. Show that in any set of 4 integers chosen from $\{1, 3, 5, 7, 9, 11\}$, at least one pair of numbers sums to 12.