Problem Set 6 Foundations Due 3/21/2011

Four of these problems will be graded, with each problem worth 5 points. Clear and complete justification is required for full credit. You are welcome to discuss these problems with anyone and everyone, but must write up your own final submission without reference to any sources other than the textbook and instructor. Submissions must be on clean paper with no ragged edges.

1. Construct a bijection from the even naturals numbers to the set $\langle 5 \rangle = \{5k \mid k \in \mathbb{N}\}$.

2. Let f and g be bounded real functions with domain D. Determine whether or not $f \cdot g$ is bounded on D.

3. Determine if the derivative of an odd function is necessarily even, odd, or neither.

4. If $f: A \to B$ and $g: B \to C$ are functions and $g \circ f$ is injective, then f is injective.

5. Let $f: \mathbb{R} \to \mathbb{R}$ be defined by $f(x) = x^3 + 5$.

   a) Prove f is injective.

   b) Prove f is surjective.

   c) Find f^{-1}, the inverse function of f.

6. If A is equipollent to B and B is equipollent to C, then A is equipollent to C.