Math 325-001 **Assignment # 0** **12 Jan 09**

Due: Jan 16th

1. Do Exercise 0.1.E in the background chapter. That is, Which of the following statements is true? For those that are false, write down the negation of the statement.

   (a) For every $n \in \mathbf{N}$, there is an $m \in \mathbf{N}$ so that $m > n$.

   (b) For every $m \in \mathbf{N}$, there is an $n \in \mathbf{N}$ so that $m > n$.

   (c) There is an $m \in \mathbf{N}$ so that for every $n \in \mathbf{N}$, $m \geq n$.

   (d) There is an $n \in \mathbf{N}$ so that for every $m \in \mathbf{N}$, $m \geq n$.

2. Do Exercise 0.2.A, (d)-(h) in the background chapter. That is, Which of the following statements is true? Prove or give a counterexample.

   (d) $A \backslash B = B \backslash A$

   (e) $(A \cup B) \backslash (A \cap B) = (A \backslash B) \cup (B \backslash A)$

   (f) $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$

   (g) $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

   (h) If $(A \cap C) \subset (B \cap C)$, then $(A \cup C) \subset (B \cup C)$.

3. Do Exercise 0.2.H, in the background chapter. That is, Suppose that f, g, h are functions from $\mathbb{R}$ into $\mathbb{R}$. Prove or give a counterexample to each of the following statements. Hint: Only one is true.

   (a) $f \circ g = g \circ f$

   (b) $f \circ (g + h) = f \circ g + f \circ h$

   (c) $(f + g) \circ h = f \circ h + g \circ h$

4. Do Exercise 0.2.I in the background chapter. That is, Suppose that $f : A \to B$ and $g : B \to A$ satisfy $g \circ f = \mathrm{id}_A$. Show that f is one-to-one and g is onto.