Math 481 - HW#2 Name: _____
Fall 2013 - Nathan Reff

1. Let $x \in \mathbb{R}$, with $x \neq 0$. Prove that for all positive integers n,

$$1 + x + x^2 + \cdots + x^n = \frac{1 - x^{n+1}}{1 - x}.$$

2. Let n be a positive integer. Suppose $x, y \in \mathbb{Z}$. Define the relation $\equiv$ by the following,

$$x \equiv y \text{ if and only if } x \bmod n = y \bmod n.$$

   (a) Show that $\equiv$ is an equivalence relation.

   (b) Suppose $n = 2$.

      i. The equivalence class [0] contains which elements?

      ii. The equivalence class [1] contains which elements?

      iii. Are there any other equivalence classes?

   (c) Suppose $n = 3$.

      i. How many distinct equivalence classes are there?

      ii. Write out the elements for each equivalence class.

   (d) Using your work from parts (b) and (c), how can you use $\equiv$ to partition the integers?