1. (50 points) Check all the correct statements (in this question only the answers will be graded).
   
   - gcd(24, 18) = 6.
   - The function $f : \left[-\frac{\pi}{2}, \frac{\pi}{2}\right] \rightarrow \mathbb{R}$ such that $f(x) = \arctan x$ is a bijection.
   - The cardinality of the set $F([3], [n]) = (4^n)^3$, where $X = F([4], [n])$.
   - The cardinality of the set $I([3], [n]) = n(n-1)(n-2)$.
   - $\binom{10}{2} = 90$. 

Name: __________________________

Pid: __________________________
2. (a) (5 points) Let $n$, $a$, and $b$ be some integers. Show that if two numbers $a$ and $b$ have the same reminders when divided by $n$, then $a - b$ is divisible by $n$.

(b) (5 points) Prove that for every integers $a_1, \ldots, a_n$ there are $k > 0$ and $\ell \geq 0$ such that $k + \ell \leq n$
and $\sum_{i=k}^{k+\ell} a_i$ is divisible by $n$. 
3. (10 points) We say that sets $A_1$, $A_2$, and $A_3$ are pairwise disjoint iff $A_i \cap A_j = \emptyset$ for every $i \neq j \in [3]$.

Construct a bijection from \{0, 1, 2, 3\} to \{(A, B, C) \mid A, B, C \subseteq [n] \text{ and } A, B, C \text{ are pairwise disjoint}\}.
4. (10 points) How many numbers from [999] are not divisible neither by 3, nor by 5, nor by 7.
5. (10 points) Let $m$ be some integer. Show that product of $m$ consecutive integers is divisible by $m!$. 