CMSC 442/653  
Instructor: Dr. Lomonaco  
Homework 2

- **Listening Assignment:** Listen to Mozart’s Eine Kleine Nachtmusik.
- **Reading Assignment:**  

1) (20pts) Let $a$ and $b$ be the permutations defined in the above handout on permutations.
   a) Using the $2 \times 11$ representation of permutations, compute the $2 \times 11$ representation of the permutation $ba$.
   b) Using the product of disjoint cycles representation of permutations $a$ and $b$, compute the product $ba$ in the product of disjoint cycles form.
   c) Using the $2 \times 11$ representation of $b$, compute the $2 \times 11$ representation of the permutation $b^{-1}$.
   d) Using the product of disjoint cycles representation of the permutation $b$, compute the inverse $b^{-1}$ in product of disjoint cycles representation form.

2) (20pts) Construct the addition and multiplication tables for the ring $R = \mathbb{Z}_{15}$
   List all the units in $R$. List all the non-trivial divisors of zero in $R$.

3) (20pts) Construct the addition and multiplication tables for the ring $R = GF(2)[x] \mod x^3 + 1 = 0$
   List all the units in $R$. List all the non-trivial divisors of zero in $R$.

4) (20pts) Construct the addition and multiplication tables for the ring $R = GF(2)[x] \mod x^4 + 1 = 0$
   List all the units in $R$. List all the non-trivial divisors of zero in $R$.

5) (20pts) Construct the addition and multiplication tables for the ring $R = GF(2)[x] \mod x^3 + x + 1 = 0$
   List all the units in $R$. List all the non-trivial divisors of zero in $R$. 