**S.-T Yau College Student Mathematics Contests**

**Algebra and Number Theory, Team, 2014**

1. Let be linear transformations of defined by

Please find all polynomials in which are invariant under and .

**2**. (1) Show that the following map

defines a bijection between the sets

and

(2) Assume . If

Satisfies

Show that

**3**. Solve the equation

For which integer , the equation is solvable

**4**. Let G be a finite group such that is a .If V is an irreducible G-module over an algebraically closed field of .

Prove that