1. Preliminary Work
   - Definition: The pullback m^* (Isomorphism between $K[G \times G]$ and $K[G] \otimes K[G]$)
   - Definition: Rational representation (with infinite-dimensional vector spaces)
   - Definition: Regular action
   - An alternate definition for rational representation for finite vector spaces, and the proof for its equivalence
   - Another equivalent definition for a rational representation which immediately follows from the last characterization
   - Definition: Invariants and the invariant ring
2. Linearly reductive groups, the Reynolds operator and Hilbert's finiteness theorem
   - Definition: Reynolds operator
   - Uniqueness of the Reynolds operator
   - Definition: linear reductiveness; definition via the Reynolds operator
   - Remark about different ways to characterize linear reductiveness
   - Definition: A multiplication in $K[G]^*$
   - Proposition: The afore mentioned multiplication makes $K[G]^*$ into an associative algebra
   - Definition: The action of $K[G]^*$ on V induced by an action of G on V.
   - A remark about how we can view the $K[G]^*$ action as an extension of the given one ($\sigma.v = \epsilon_\sigma \cdot v$ where $\epsilon_\sigma \in K[G]^*$ is the evaluation homomorphism).
   - Remark: $K[G]^*$ contains the Lie algebra as a subalgebra.
   - Proposition: A regular action of G on an affine variety X induces a rational representation $K[X]$ of G
   - Proposition: A Reynolds operator on $K[G]$ (action via left-multiplication) yields a Reynolds operator on $K[X]$ for any regular action of G on X
   - TODO:
     The usual lemmas for Hilbert's finiteness theorem
     Hilbert's finiteness theorem
3. Cayley's Ω-Process
   - Definition: Cayley's Ω-Process
   - A Lemma about a relationship between m^* and Ω

- Lemma and Definition: The constants $c_{p,n} := \Omega^p(\det(Z)^p)$
- Theorem: GL_n is linearly reductive via the Reynolds operator that can be defined by Cayley's Ω-process
- Corollary: SL_n is linearly reductive

4. Examples (known or easy ones)

   - The cross ratio
   - SAS^T