**Algebra Roadmap**

**Unit 1: Complex Numbers and Theory of Equations**

1. **Complex Numbers**
   * **Basics**: Definition and arithmetic of complex numbers.
   * **Polar Representation**: Representing complex numbers in polar form.
   * **De Moivre’s Theorem**: Study the theorem and its applications, including finding the nth roots of unity.
2. **Theory of Equations**
   * **Roots and Coefficients**: Relationship between the roots and coefficients of polynomial equations.
   * **Transformation of Equations**: Methods to transform equations.
   * **Location of Roots**: Descartes' rule of signs and Sturm’s theorem.
   * **Cubic and Biquadratic Equations**: Methods like Cardano’s, Ferrari’s, and Euler’s for solving these equations.
3. **Inequalities**
   * **AM-GM-HM Inequality**: Understanding arithmetic mean, geometric mean, and harmonic mean inequalities.
   * **Cauchy-Schwarz Inequality**: Study this fundamental inequality and its applications.

**Unit 2: Relations, Divisibility, and Prime Numbers**

1. **Relations**
   * **Equivalence Relations**: Properties of equivalence relations.
   * **Partial Order Relations**: Understanding posets and linear order relations.
   * **Well-Ordering Property**: Study the well-ordering property of positive integers.
2. **Divisibility and Prime Numbers**
   * **Division Algorithm**: Learn the division algorithm and Euclidean algorithm.
   * **Prime Numbers**: Properties of prime numbers and Euclid’s theorem.
   * **Congruence Relations**: Understanding congruence relations between integers.
   * **Mathematical Induction**: Principles of mathematical induction.
   * **Fundamental Theorem of Arithmetic**: Statement and implications of this theorem.

**Unit 3: Systems of Linear Equations and Linear Independence**

1. **Linear Equations**
   * **Row Reduction and Echelon Forms**: Methods for solving systems of linear equations.
   * **Vector Equations**: Understanding the matrix equation (Ax = b) and solution sets of linear systems.
   * **Applications**: Various applications of linear systems.
2. **Linear Independence**
   * **Concept**: Understanding linear independence and its significance.

**Unit 4: Linear Transformations and Eigenvalues**

1. **Linear Transformations**
   * **Introduction**: Learn about linear transformations and their matrices.
   * **Inverse of a Matrix**: Characterizations of invertible matrices.
2. **Subspaces and Dimension**
   * **Subspaces of (Rn)**: Understanding subspaces and their geometric significance.
   * **Rank of a Matrix**: Learning about the rank of a matrix and its implications.
3. **Eigenvalues and Eigenvectors**
   * **Characteristic Equation**: Study the characteristic equation of a matrix.
   * **Cayley-Hamilton Theorem**: Learn the theorem and its use in finding the inverse of a matrix.

**Recommended Study Approach**

1. **Start with Basics**: Use introductory books and resources to build a strong foundation.
2. **Practice Regularly**: Work through exercises and problems to reinforce understanding.
3. **Use Visual Aids**: Utilize graphical demonstrations and plotting tools to visualize concepts.
4. **Supplement Learning**: Use online tutorials, videos, and courses to complement your reading.
5. **Review and Revise**: Regularly review and revise topics to ensure retention and understanding.

**Beginner-Friendly Books**

1. **"Algebra for Beginners" by Charles Smith** - A straightforward introduction to algebraic concepts.
2. **"Basic Algebra" by Anthony W. Knapp** - Provides a solid foundation in algebra.
3. **"Linear Algebra: A Modern Introduction" by David Poole** - Accessible for beginners and provides a good introduction to linear algebra.
4. **"Introduction to Linear Algebra" by Gilbert Strang** - A well-regarded text that is beginner-friendly.

Would you like more details on any specific topic or additional resources to help you get started?

**Sources**

1. [Algebra For Beginners - Basic Introduction - YouTube](https://www.youtube.com/watch?v=MHeirBPOI6w)
2. [Algebra for Beginners | Basics of Algebra](https://www.youtube.com/watch?v=PVoTRu3p6ug)
3. [Algebra 1 Basics for Beginners](https://www.youtube.com/watch?v=tTomwopxKFE)
4. [Khan Academy](https://www.khanacademy.org/math/algebra)
5. [Algebra I / Beginning Algebra](https://homeschoolalgebra.com/wp-content/uploads/2019/07/Beginning-Algebra-Syllabus-1.pdf)
6. [Algebra 1 – Mathplanet](https://www.mathplanet.com/education/algebra-1)
7. [Class Syllabus: Algebra 101: Beginner to Intermediate Level](https://www.universalclass.com/i/course/algebra/syllabus.htm)