Geometric and Algebraic Vectors

Curriculum Expectations

By the end of this course, students will:
- recognize a vector as a quantity with both magnitude and direction, and identify, gather, and interpret information about real-world applications of vectors
- represent a vector in two-space geometrically as a directed line segment, with directions expressed in different ways, and recognize vectors with the same magnitude and direction but different positions as equal vectors
- perform the operations of addition, subtraction, and scalar multiplication on vectors represented as directed line segments in two-space
- determine some properties of the operations of addition, subtraction, and scalar multiplication of vectors
- solve problems involving the addition, subtraction, and scalar multiplication of vectors, including problems arising from real-world applications
- represent vectors algebraically (e.g., using Cartesian coordinates)
- determine the algebraic representations of a vectors given as a directed line segments, or *vice versa*
- recognize that points and vectors can both be represented algebraically, and determine the distance between two points and the magnitude of a vector
- perform the operations of addition, subtraction, and scalar multiplication on vectors represented algebraically in two-space and three-space
- determine some properties of addition, subtraction, and scalar multiplication of algebraic vectors
- perform the operation of dot product on two vectors both geometrically and algebraically, and determine properties of the dot product
- perform the operation of cross product on two vectors both geometrically and algebraically, and determine properties of the cross product
- solve problems involving the dot product and cross products (e.g., work, torque, geometric applications)

Schedule of Topics

Day	Topic	Homework	Questions?
1	Prerequisite Skills		
2	Vector Basics		
3	Vector Addition and Subtraction		
4	Multiplying Vectors By Scalars		
5	Applications: Force		
6	Applications: Velocity		
7	Vector Components		
8	Mid-Unit Review		
9	Algebraic Vectors in R^2 and R^3		
10	Magnitudes/Direction Angles in R^2 and R^3		
11	Operations with Algebraic Vectors		
12	Dot Product		
13	Cross Product		
14	Geometric Applications of Dot/Cross Products		
15	Work and Torque		
16	Unit Review		

Skills Checklist

By the end of this unit, I am able to:

- identify both vector and scalar quantities [ ] Always [ ] Often [ ] Seldom
- describe key properties of vectors (e.g. magnitude, direction) [ ] Always [ ] Often [ ] Seldom
- determine whether two vectors are equal, opposite, or parallel [ ] Always [ ] Often [ ] Seldom
- determine the resultant when two vectors are added together [ ] Always [ ] Often [ ] Seldom
- determine the resultant when a vector is subtracted from another [ ] Always [ ] Often [ ] Seldom
- determine the resultant of a vector multiplied by a scalar [ ] Always [ ] Often [ ] Seldom
- combine vector addition, subtraction and scalar multiplication [ ] Always [ ] Often [ ] Seldom
- draw vectors resulting from addition, subtraction, scalar mult. [ ] Always [ ] Often [ ] Seldom
- solve simple problems involving forces [ ] Always [ ] Often [ ] Seldom
- solve problems involving velocities [ ] Always [ ] Often [ ] Seldom
- determine the rectangular components of a vector [ ] Always [ ] Often [ ] Seldom
- solve problems using vector components [ ] Always [ ] Often [ ] Seldom
- visualize and sketch vectors in R^2 and R^3 [ ] Always [ ] Often [ ] Seldom
- express vectors in and R^2 and R^3 using different forms [ ] Always [ ] Often [ ] Seldom
- express a geometric vector algebraically [ ] Always [ ] Often [ ] Seldom
- express an algebraic vector geometrically [ ] Always [ ] Often [ ] Seldom
- determine the magnitude of an algebraic vector [ ] Always [ ] Often [ ] Seldom
- determine the direction angles of an algebraic vector [ ] Always [ ] Often [ ] Seldom
- add or subtract algebraic vectors [ ] Always [ ] Often [ ] Seldom
- multiply an algebraic vector by a scalar [ ] Always [ ] Often [ ] Seldom
- calculate the dot product of two vectors geometrically [ ] Always [ ] Often [ ] Seldom
- calculate the dot product of two vectors algebraically [ ] Always [ ] Often [ ] Seldom
- calculate the cross product of two vectors geometrically [ ] Always [ ] Often [ ] Seldom
- calculate the dot product of two vectors algebraically [ ] Always [ ] Often [ ] Seldom
- solve geometric problems involving the dot and cross products [ ] Always [ ] Often [ ] Seldom
- solve physical problems involving the dot and cross products [ ] Always [ ] Often [ ] Seldom