Key Concepts Review

In Chapter 6, you were introduced to vectors: quantities that are described in terms of both magnitude and direction. You should be familiar with the difference between a geometric vector and an algebraic vector. Consider the following summary of key concepts:

- Scalar quantities have only magnitude, while vector quantities have both magnitude and direction.
- Two vectors are equal if they have the same magnitude and direction.
- Two vectors are opposite if they have the same magnitude and opposite directions.
- When vectors are drawn tail-to-tail, their sum or resultant is the diagonal of the parallelogram formed by the vectors.
- When vectors are drawn head-to-tail, their sum or resultant is the vector drawn from the tail of the first to the head of the second.
- Multiplying a vector by a nonzero scalar results in a new vector in the same or opposite direction of the original vector with a greater or lesser magnitude compared to the original. The set of vectors formed are described as collinear (parallel vectors).
- The vector $\overrightarrow{OP}$ is called a position vector and is drawn on a coordinate axis with its tail at the origin and its head located at point P.
- In R^2, $\overrightarrow{OP} = (a, b) = a\vec{i} + b\vec{j}$, $|\overrightarrow{OP}| = \sqrt{a^2 + b^2}$ where $\vec{i} = (1, 0)$ and $\vec{j} = (0, 1)$.
- In R^3, $\overrightarrow{OP} = (a, b, c) = a\vec{i} + b\vec{j} + c\vec{k}$, $|\overrightarrow{OP}| = \sqrt{a^2 + b^2 + c^2}$ where $\vec{i} = (1, 0, 0)$, $\vec{j} = (0, 1, 0)$ and $\vec{k} = (0, 0, 1)$.
- In R^2, the vector between two points with its tail at $A(x_1, y_1)$ and head at $B(x_2, y_2)$ is determined as follows:
  $\overrightarrow{AB} = \overrightarrow{OB} - \overrightarrow{OA} = (x_2, y_2) - (x_1, y_1) = (x_2 - x_1, y_2 - y_1)$
  $|\overrightarrow{AB}| = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
- In R^3, the vector between two points with its tail at $A(x_1, y_1, z_1)$ and head at $B(x_2, y_2, z_2)$ is determined as follows:
  $\overrightarrow{AB} = \overrightarrow{OB} - \overrightarrow{OA} = (x_2, y_2, z_2) - (x_1, y_1, z_1) = (x_2 - x_1, y_2 - y_1, z_2 - z_1)$
  $|\overrightarrow{AB}| = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2}$
- Any pair of nonzero, noncollinear vectors will span R^2.
- Any pair of nonzero, noncollinear vectors will span a plane in R^3.