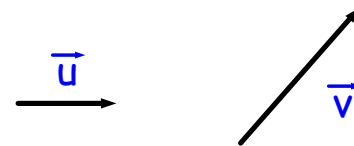


5.2 Multiplication of a Vector by a Scalar

For the vector $k\vec{a}$, where k is a scalar and \vec{a} is a nonzero vector:

- If $k > 0$, then $k\vec{a}$ is in the same direction as \vec{a} with magnitude $k|\vec{a}|$.
- If $k < 0$, then $k\vec{a}$ is in the opposite direction as \vec{a} with magnitude $|k||\vec{a}|$.

Ex. 1 Given the vector \vec{u} and \vec{v} as shown, draw a vector for each of the following.



a) $3\vec{u}$

b) $-0.5\vec{v}$

c) $2\vec{u} - \vec{v}$

d) $\frac{2}{3}\vec{v} - 2\vec{u}$

The zero vector: multiplication of the zero vector by a scalar gives the zero vector.
ie. $k\vec{0} = \vec{0}$

The unit vector: dividing any vector by its magnitude gives the unit vector....a vector in the same direction that is 1 unit long.

$\frac{\vec{x}}{|\vec{x}|}$ is a vector in the same direction as \vec{x} with a magnitude of 1.

Collinear Vectors:

- Two vectors are collinear if they are parallel or can be translated to the same straight line. (ie. same direction).
- Two vectors \vec{u} and \vec{v} are collinear if and only if it is possible to find a nonzero scalar k such that $\vec{u} = k\vec{v}$.

***parallel and collinear are used interchangeably

Ex. 2 The vectors \vec{a} and \vec{b} are unit vectors that make an angle of 57° with each other. Determine the magnitude and direction of $2\vec{a} - 3\vec{b}$.

(describe the direction relative to either a or b)

Ex. 3 The angle between x and y is 110° . If $|\vec{x}| = 7$ and $|\vec{y}| = 5$, determine the unit vector in the same direction as $\vec{x} + \vec{y}$.

Ex. 4 Three collinear vectors, \vec{u} , \vec{v} , and \vec{w} are related to each other such that $\vec{u} = 2\vec{v}$ and $\vec{v} = 3\vec{w}$. Determine integer values for a and b such that $a\vec{v} + b\vec{w} = \vec{0}$.

Ex. 5 In $\triangle ABC$, a median is drawn from A to the midpoint of BC which is labelled D . If $\overrightarrow{AB} = \vec{b}$ and $\overrightarrow{AC} = \vec{c}$, prove that $\overrightarrow{AD} = \frac{1}{2}\vec{b} + \frac{1}{2}\vec{c}$.

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