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(1) (M&T, §1.1: #22) Let $\vec{u} = (1, 2)$, $\vec{v} = (-3, 4)$, and $\vec{w} = (5, 0)$.
- Draw these vectors in $\mathbb{R}^2$.
- Find scalars λ_1 and λ_2 so that $\vec{w} = \lambda_1\vec{u} + \lambda_2\vec{v}$.

(2) (M&T, §1.2: #15) What is the geometric relation between the vectors $\vec{u}$ and $\vec{v}$ if one has that $\vec{u} \cdot \vec{v} = -\|\vec{u}\|\|\vec{v}\|$? What is a formula for $\text{Proj}_{\vec{u}}\vec{v}$?

(3) Suppose A, B and C are collinear, and

$$\frac{\|\overrightarrow{AB}\|}{\|\overrightarrow{BC}\|} = \frac{\lambda}{1-\lambda}, \qquad \lambda \in (0, 1).$$

Show that $B = (1 - \lambda)A + \lambda C$.

$$\overrightarrow{AB} = \lambda\overrightarrow{AC}, \qquad B - A = \lambda(C - A)$$

(4)
- (M&T, §1.2: #6) Compute $\|\vec{u}\|, \|\vec{v}\|$, $\vec{u} \cdot \vec{v}$ for $\vec{u} = 15\vec{i} - 2\vec{j} + 5\vec{k}$ and $\vec{v} = \pi\vec{i} + 3\vec{j} - \vec{k}$.
- (M&T, §1.2: #20) Find the projection of $\vec{u} = -\vec{i} + \vec{j} + \vec{k}$ onto $\vec{v} = 2\vec{i} + \vec{j} - 3\vec{k}$.

(5)
- Find the length of $\vec{v} = 2\vec{i} - 6\vec{j} + 7\vec{k}$.
- Find all the values of c for which $\|\vec{i} + \vec{j} + c\vec{k}\| = 4$.