Exercises in Physics
Assignment

Date Given: April 8, 2022
Date Due: April 14, 2022

P1. (1 point) With $\boldsymbol{v} = (1, 1)$ and $\boldsymbol{w} = (1, 5)$ find a number c so that $\boldsymbol{w} - c\boldsymbol{v}$ is perpendicular to $\boldsymbol{v}$.

P2. (1 point) What are the cosines of the angles α, β, γ between the vector $\boldsymbol{v} = (1, 0, -1)$ and the unit vectors $\boldsymbol{i}, \boldsymbol{j}, \boldsymbol{k}$ along the axes?

P3. (3 points) Assume that three unit vectors $\boldsymbol{a}, \boldsymbol{b}, \boldsymbol{c}$ are such that $\boldsymbol{a}+\boldsymbol{b}+\boldsymbol{c} = \boldsymbol{0}$. Compute $\boldsymbol{a}\cdot\boldsymbol{b}+\boldsymbol{b}\cdot\boldsymbol{c}+\boldsymbol{c}\cdot\boldsymbol{a}$.

P4. (3 points) Compute $\boldsymbol{a} \times \boldsymbol{b}$ for

(a) $\boldsymbol{a} = \boldsymbol{i} - \boldsymbol{j} + \boldsymbol{k}$ and $\boldsymbol{b} = -\boldsymbol{i} + \boldsymbol{j} - \boldsymbol{k}$

(b) $\boldsymbol{a} = 6\boldsymbol{i} + \boldsymbol{j}$ and $\boldsymbol{b} = 3\boldsymbol{i} - 2\boldsymbol{j}$

(c) $\boldsymbol{a} = \boldsymbol{i} + \boldsymbol{j} + \boldsymbol{k}$ and $\boldsymbol{b} = \boldsymbol{j}$

P5. (2 points) Assume that three-dimensional vectors $\boldsymbol{a}$ and $\boldsymbol{b}$ are not collinear (do not lie on a single straight line). Find a scalar λ such that the vectors $\lambda\boldsymbol{a} + \boldsymbol{b}$ and $3\boldsymbol{a} + \lambda\boldsymbol{b}$ are collinear.