

Problem Set 1 – Vectors

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October 3, 2020

Problem 1

A hiker walks 11 km due north from camp and then turns and walks 11 km due east. What is the displacement of the hiker from the camp?

Problem 2

Find the sum, difference, and dot products of the following vector pairs:

a) $\vec{A} = \langle 3, 2 \rangle, \vec{B} = \langle 4, 7 \rangle$

b) $\vec{C} = \langle 24, -1 \rangle, \vec{D} = \langle 23, 8 \rangle$

c) $\vec{E} = \langle 1, 2, 3 \rangle, \vec{F} = \langle 4, 5, 6 \rangle$

Problem 3

Point β is 29 km east of point α . A person then walks 13 km in a direction 37° south of east from point α and then walks 9.0 km due north. How far is the person then from point β ?

Problem 4

Vector \vec{A} has a magnitude of 10m, and vector \vec{B} has a magnitude of 67m. If $\vec{A} \cdot \vec{B} = 335$, what is the angle between the two vectors?

Problem 5

Show that the two definitions we defined for the dot product are equivalent, i.e. for any 2 vectors $\vec{a} = \langle a_x, a_y \rangle, \vec{b} = \langle b_x, b_y \rangle, |\vec{a}||\vec{b}| \cos \theta = a_x b_x + a_y b_y$. (Hint: Start off by using the law of cosines on the two vectors and their included angle.)