

PHY 121 Homework Assignment 1

Dr. MacDonald

ASU Spring 2019

Due: Wednesday, January 16th 2019, in class

Points: 60 (10 per problem)

Problem 1:

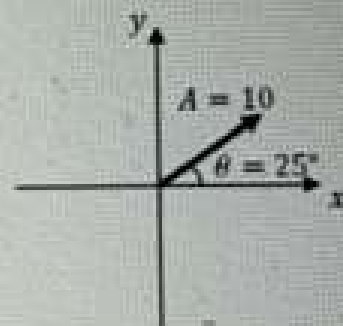
Using dimensional analysis, construct a constant, with units of length *only*, out of *all three* of the following fundamental constants of Nature: h , G , and c . Here, h is Planck's constant, which has dimensions of $[M][L]^2[T]^{-1}$, G is Newton's gravitational constant, which has dimensions of $[M]^{-1}[L]^3[T]^{-2}$, and c is the speed of light, with dimensions $[L][T]^{-1}$.

Problem 2:

How many hairs do you have on your head? *Do not Google the answer! Use knowledge you already have to make a good estimation of the answer. You must be within the right order of magnitude to receive full credit.*

Problem 3:

Consider the vector \vec{A} shown in the figure, with magnitude given by $A = 10$, that makes an angle of $\theta = 25^\circ$ with the x -axis.



- Find a vector, \vec{B} , such that $\vec{A} + \vec{B} = 0$. What is the magnitude of \vec{B} ? Carefully sketch both \vec{A} and \vec{B} , making sure they are proportional.
- Find a unit vector, \hat{u} , such that $\vec{A} \cdot \hat{u} = 0$.
- Let $\vec{V} = 5\hat{x} - 7\hat{y}$. Compute $\vec{A} \times \vec{V}$ and $\vec{V} \times \vec{A}$. Compare your answers; does this make sense?

Problem 4: Problem 1.62 in Young & Freedman

A plane leaves the airport in Galisteo and flies 170 km at 68.0° east of north; then it changes direction to fly 230 km at 36.0° south of east, after which it makes an immediate emergency landing in a pasture. When the airport sends out a rescue crew, in which direction and how far should this crew fly to go directly to this plane?

Problem 5: Problem 1.76 in Young & Freedman

Ricardo and Jane are standing under a tree in the middle of a pasture. An argument ensues, and they walk away in different directions. Ricardo walks 26.0 m in a direction 60.0° west of north. Jane walks 16.0 m in a direction 30.0° south of west. They then stop and turn to face each other.

- What is the distance between them?
- In what direction should Ricardo walk to go directly toward Jane?