In Lab Problems for Phy241Lab02

(1) A vector $\vec{A}$ is given by $\vec{A}=5\hat{i}+4\hat{j}$. Find the following:

(a) what is the magnitude of $\vec{A}$?
(b) what is the angle the vector makes with the x-axis?
(c) what is the angle the vector makes with the y-axis
(d) Express this vector using the "hat" notation.
(e) Express this vector using the "x-y" unit vector notation.

(2) Suppose a vector $\vec{B}$ is given by $\vec{B}=3\hat{i}+2\hat{j}$. Find the following:

(a)What is $2\vec{B}$? (b) What is $\vec{B}+\vec{A}$? (c) What is $\vec{B}-\vec{A}$?

(d) What is $\vec{B}\bullet\vec{A}$? (dot product)

(e) What is the angle made with respect to the positive x-axis by $\vec{B}+\vec{A}$?

(3) Suppose a vector $\vec{C}$ is given by $\vec{C}=8\hat{i}-9\hat{j}$. A person walks along vector $\vec{A}$, then vector $\vec{B}$, followed by vector $\vec{C}$. At the end of this journey, what is the displacement (vector) and the distance from the origin. You may assume all units are in m here.

(4) The length of the barrel of a dart gun is 1.2 m. Upon leaving the barrel, a dart has a speed of 12 m/s. Assuming that the dart is uniformly accelerated, how long does it take for the dart to travel the length of the barrel?

(5) A ball is dropped from rest through a distance of 20 m. How fast is the ball moving when it hits the ground? Suppose the ball was given a velocity in the x direction of 5 m/s. How far in the x direction will the ball travel before it hits the ground?

(6) Suppose one of my faster cats is chasing a mouse (which is even faster). My cat leaps into the air at a 33^0 angle. If my cat was initially moving at 10 m/s, (a) what was my cat's range and (b) how long was my cat in the air?

(7) Suppose a squirrel is hanging from a tree. The distance from the ground is Y_t m. A hunter is in a foxhole located a distance X_t from the tree and the barrel of the gun is at ground level. When the gun makes a noise, the squirrel drops from the tree (always). Where should the hunter point the gun to be 100% sure of hitting the squirrel under these conditions?