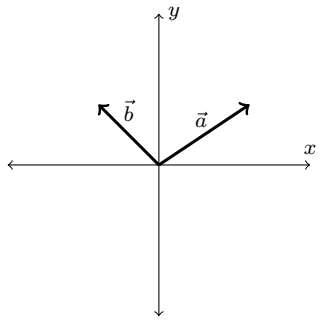
Math 8
Vectors in 2-Space and 3-Space

Practice Problems

1) Given the vectors $\vec{a}$ and $\vec{b}$



sketch in 2-Space the following vectors.

a) $\vec{a}+\vec{b}$ b) $\vec{a}-\vec{b}$ c) $-\vec{a}+2\vec{b}$

2) Let $\vec{a} =< 5, -12, 1 >$ and $\vec{b} =< -1, 2, 8 >$. Find the following

a) $\vec{a}+\vec{b}$ c) $3\vec{a}-2\vec{b}$

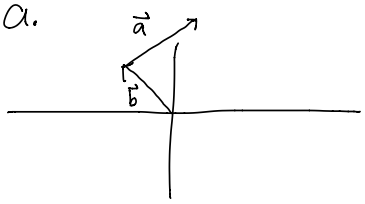
b) $|\vec{a}+\vec{b}|$ d) $|3\vec{a}-2\vec{b}|$

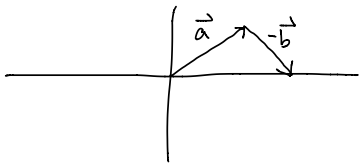
3) Let $\vec{a} =< 1, \sqrt{3}, 0 >$

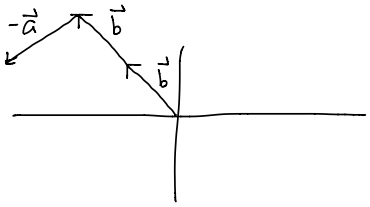
a) What is the angle between $\vec{a}$ and the x-axis?

b) What is the angle between $\vec{a}$ and the vector $< 0, 0, 1 >$?

4) A person walks due west on the deck of a ship at 3 mi/h. The ship is moving north at a speed of 22 mi/h. Find the speed and direction of the women relative to the surface of the water.

1) a. 

b. 

c. 

2) Let $\vec{a}=\langle 5,-12,1\rangle$ and $\vec{b}=\langle -1,2,8\rangle$.

a) $\vec{a}+\vec{b} = \langle 5-1,-12+2,1+8\rangle = \langle 4,-10,9\rangle$

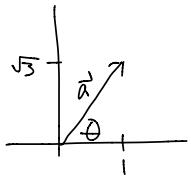
b) $|\vec{a}+\vec{b}| = \sqrt{4^2+(-10)^2+9^2} = \sqrt{16+100+81} = \sqrt{197}$

c) $3\vec{a}-2\vec{b} = \langle 15,-36,3\rangle - \langle -2,4,16\rangle = \langle 17,-40,-13\rangle$

d) $|3\vec{a}-2\vec{b}| = \sqrt{17^2+(-40)^2+(-13)^2} = \sqrt{289+1600+169} = \sqrt{2058}$

3) Let $\vec{a}=\langle 1,\sqrt{3},0\rangle$

a) The angle between $\vec{a}$ and the x-axis:



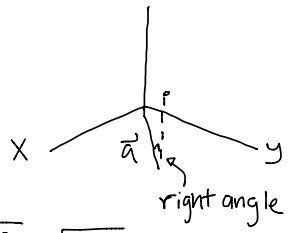
$\cos(\theta) = \frac{1}{|\vec{a}|} = \frac{1}{\sqrt{1+3}} = 1/2$

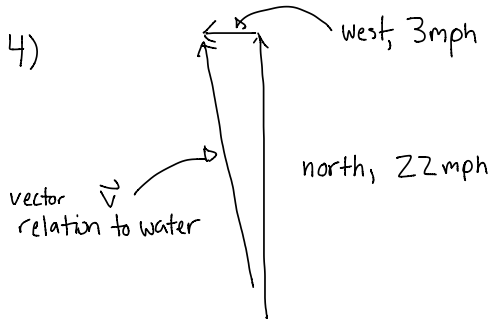
so $\theta = \arccos(1/2) = \pi/3 = 60°$

b) The angle between $\vec{a}$ and $\langle 0,0,1\rangle$:

$\vec{a}$ lies in the xy-plane, while $\langle 0,0,1\rangle$ is in the z-direction.

The angle between them will be $\pi/2 = 90°$



4) 

Speed is $|\vec{v}| = \sqrt{3^2+22^2} = \sqrt{493}$

Direction is $\left\langle \frac{-3}{\sqrt{493}}, \frac{22}{\sqrt{493}} \right\rangle$

indicates west ↑ ↑ indicates north