Week In Review 1

Math 151 - Fall 2022
Liwei Chen

Problems:

1. Find the vector $\overrightarrow{AB}$.
   (a) $A(1,3)$ and $B(4,4)$
   (b) $A(3,-1)$ and $B(3,-3)$
2. Find the sum of $\langle 2,3\rangle$ and $\langle 3,-4\rangle$. Sketch it on the 2-dim plane.
3. Given $\boldsymbol{a} = 5\boldsymbol{i} - 12\boldsymbol{j}$ and $\boldsymbol{b} = -2\boldsymbol{i} + 8\boldsymbol{j}$.
   (a) Find $\|\boldsymbol{a}\|$.
   (b) Find a unit vector in the direction of $\boldsymbol{a}$.
   (c) Find $3\boldsymbol{a} + 4\boldsymbol{b}$.
4. Jack walks due west on the deck of a ship at 3 mph. The ship is moving north at a speed of 20 mph. Find the speed and direction of Jack relative to the surface of the water.
5. Two forces $\boldsymbol{F_1}$ and $\boldsymbol{F_2}$ with magnitudes 5 lb and 10 lb act on an object. $\boldsymbol{F_1}$ is pointing towards N45°W and $\boldsymbol{F_2}$ is pointing towards N60°E. Find the resultant force $\boldsymbol{F}$ as well as its magnitude and its direction.
6. Find $\boldsymbol{a} \cdot \boldsymbol{b}$.
   (a) $\boldsymbol{a} = \langle 2,3\rangle$ and $\boldsymbol{b} = \langle 3,-4\rangle$
   (b) $\|\boldsymbol{a}\| = 3$, $\|\boldsymbol{b}\| = 4$, and the angle between $\boldsymbol{a}$ and $\boldsymbol{b}$ is $\pi/3$
7. Find the angle between $\boldsymbol{i} + 3\boldsymbol{j}$ and $2\boldsymbol{i} - 4\boldsymbol{j}$.
8. Given the points $A(1,0)$, $B(2,3)$, and $C(-1,7)$, find the angle $\angle ABC$.
9. Determine whether $\boldsymbol{a}$ and $\boldsymbol{b}$ are orthogonal or not.
   (a) $\boldsymbol{a} = \langle 3,1\rangle$ and $\boldsymbol{b} = \langle -3,9\rangle$
   (b) $\boldsymbol{a} = 2\boldsymbol{i} - 7\boldsymbol{j}$ and $\boldsymbol{b} = 5\boldsymbol{i} + 3\boldsymbol{j}$
10. A force $\boldsymbol{F} = \boldsymbol{i} + 3\boldsymbol{j}$ is used to move an object from the point $(2,3)$ to $(4,8)$. How much work is done by the force if distance is in meters and force is in Newtons?
11. Find the scalar and vector projection of $\langle 3,1\rangle$ onto $\langle 2,5\rangle$.
12. Find the distance from the point $(1,5)$ to the line $2x - y = 3$.