6.6 Operations with Algebraic Vectors in R^2

A 2D Algebraic Vectors A 2D Algebraic Vector may be written in *components form* as: $\vec{v}=(v_x,v_y)$ or in *terms of unit vectors* as: $\vec{v}=v_x\vec{i}+v_y\vec{j}$ and has a *magnitude* given by: $\Vert\vec{v}\Vert=\sqrt{v_x^2+v_y^2}$	Ex 1. Consider the vector $\vec{a}=-3\vec{i}+4\vec{j}$. a) Write the vector in components form. b) Find the magnitude of the vector $\vec{a}$.
B Addition of 2D Algebraic Vectors The sum of two 2D algebraic vectors $\vec{a}=(a_x,a_y)=a_x\vec{i}+a_y\vec{j}$ and $\vec{b}=(b_x,b_y)=b_x\vec{i}+b_y\vec{j}$ is a 2D algebraic vector given by: $\vec{a}+\vec{b}=a_x\vec{i}+a_y\vec{j}+b_x\vec{i}+b_y\vec{j}$ $=(a_x+b_x)\vec{i}+(a_y+b_y)\vec{j}=(a_x+b_x,a_y+b_y)$	Ex 2. Find the sum of the vector $\vec{a}=3\vec{i}-5\vec{j}$ and $\vec{b}=(-2,7)$.
C Subtraction of 2D Algebraic Vectors The difference of two 2D algebraic vectors $\vec{a}=(a_x,a_y)=a_x\vec{i}+a_y\vec{j}$ and $\vec{b}=(b_x,b_y)=b_x\vec{i}+b_y\vec{j}$ is a 2D algebraic vector given by: $\vec{a}-\vec{b}=a_x\vec{i}+a_y\vec{j}-(b_x\vec{i}+b_y\vec{j})$ $=(a_x-b_x)\vec{i}+(a_y-b_y)\vec{j}=(a_x-b_x,a_y-b_y)$	Ex 3. Find the difference $\vec{d}=\vec{a}-\vec{b}$ between the vector $\vec{a}=3\vec{i}-5\vec{j}$ and $\vec{b}=(-2,7)$.
D Multiplication of 2D Algebraic Vector by a Scalar The multiplication of a 2D algebraic vector $\vec{a}=(a_x,a_y)=a_x\vec{i}+a_y\vec{j}$ by a scalar λ is a 2D algebraic vector given by: $\lambda\vec{a}=\lambda(a_x\vec{i}+a_y\vec{j})=\lambda a_x\vec{i}+\lambda a_y\vec{j}=(\lambda a_x,\lambda a_y)$	Ex 4. For each case, multiply the given vector by the given scalar. a) $\vec{u}=(-1,3),\quad \lambda=-2$ b) $\vec{v}=4\vec{i}-2\vec{j},\quad \mu=\frac{1}{2}$ Ex 5. Consider $\vec{a}=(3,-5)$, $\vec{b}=(0,-2)$, and $\vec{c}=(-1,0)$. Find the vector $\vec{v}=-2\vec{a}+3\vec{b}-4\vec{c}$.
E Vector Equations Use backward operations to solve equations involving vectors: $\vec{x}+\vec{a}=\vec{b}\quad\Rightarrow\quad\vec{x}=\vec{b}-\vec{a}$ $\vec{a}-\vec{x}=\vec{b}\quad\Rightarrow\quad\vec{x}=\vec{a}-\vec{b}$ $\lambda\vec{x}=\vec{a}\quad\Rightarrow\quad\vec{x}=\frac{1}{\lambda}\vec{a}$	Ex 6. Given $\vec{a}=(-2,1)$, $\vec{b}=(1,-3)$ solve for $\vec{x}$ the following vector equation $2\vec{a}-3\vec{x}=\vec{b}$.

Ex 7. Find the perimeter of the triangle ΔABC where $A(0,1)$, $B(2,3)$, and $C(-1,-2)$.	Ex 8. Find an unit vector parallel to the vector $\vec{a}=(3,-4)$.
Ex 9. Given $A(-2,3)$, $B(-1,-2)$, and $D(4,2)$, find the point C such that the polygon $ABCD$ is a parallelogram.	Ex 10. Find the angle between $\overrightarrow{PQ}$ and $\overrightarrow{PR}$ where $P(2,0)$, $Q(0,3)$, and $R(-3,-4)$.

Reading: Nelson Textbook, Pages 319-324
Homework: Nelson Textbook: Page 324 #1, 3, 5, 7c, 11, 13b, 17

