Eric Tiet MCV4U1-03

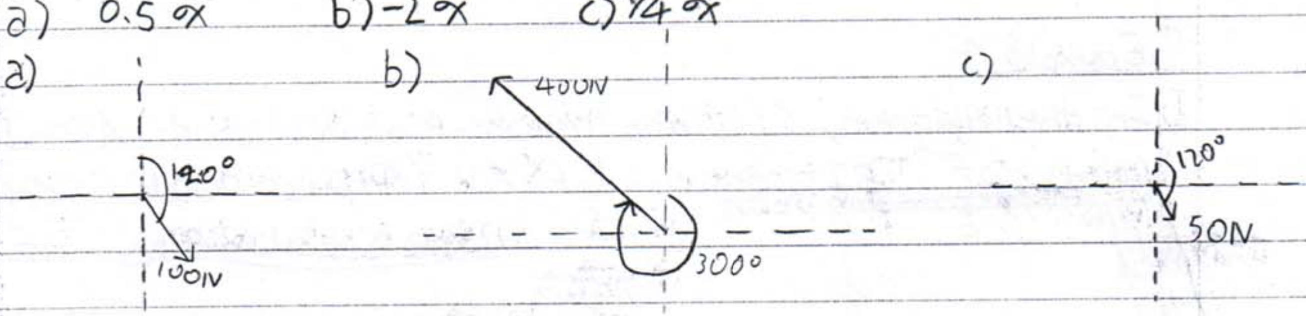
ΩW p. 334 # 1bd, 2bdf, 3, 4bdf, 5bd, 6bd, 7bd, 11bdf, 10

6.3 Multiplying a Vector by a Scalar

3 properties - Commutative $\vec{a}+\vec{b}=\vec{b}+\vec{a}$
associative $(\vec{a}+\vec{b})+c=\vec{a}+(\vec{b}+\vec{c})$
ID $\vec{0}+\vec{a}=\vec{a}=\vec{a}+\vec{0}$

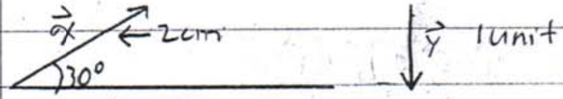
3 new properties for scalar multiplication
For any vectors $\vec{a}$ and $\vec{b}$, and scalars $k, m \in \mathbb{R}$:
$k(\vec{a}+\vec{b})=k\vec{a}+k\vec{b}$ (distributive property)
$k(m\vec{a})=(km)\vec{a}$ (associative)
$1\vec{a}=\vec{a}$ (ID)

Example 1
Suppose $|\vec{x}|=200N$, at a true bearing of 120°. Draw a scale diagram to represent each vector. scale 1 cm = 100N
a) $0.5\vec{x}$ b) $-2\vec{x}$ c) $1/4\vec{x}$

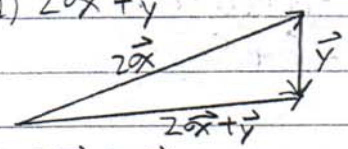


Example 2
Simplify algebraically
a) $\vec{x}+\vec{x}+2\vec{x}-\vec{x}$
$=3\vec{x}$
b) $-2(\vec{x}+\vec{y})+3\vec{y}+\vec{x}$
$=-2\vec{x}-2\vec{y}+3\vec{y}+\vec{x}$
$=-\vec{x}+\vec{y}$

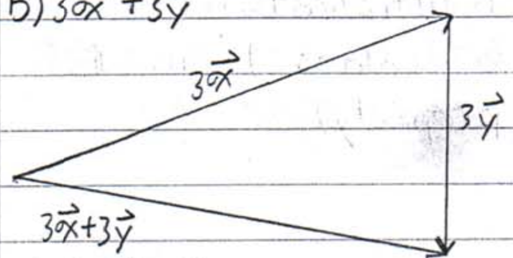
Example 3
Copy vectors $\vec{x}$ and $\vec{y}$. Then draw a vector diagram to illustrate each combination of vectors.



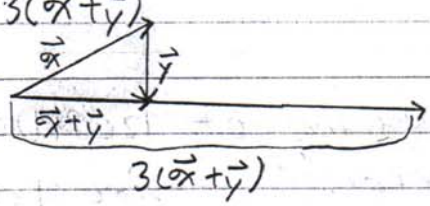
a) $2\vec{x}+\vec{y}$



b) $3\vec{x}+3\vec{y}$

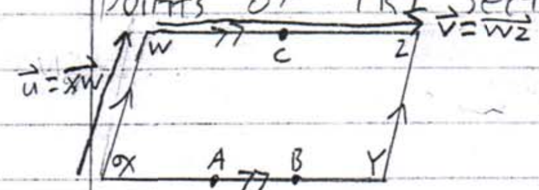


c) $3(\vec{x}+\vec{y})$



Example 4

In the diagram, C is the midpoint of WZ and A and B are th
points of TRI section of XY. Express each vector in term
of a linear combination of $\vec{u}=\overrightarrow{XW}$ and
$\vec{v}=\overrightarrow{WZ}$



a) $\overrightarrow{AB}=\frac{1}{3}\vec{v}$

b) $\overrightarrow{AZ}=\frac{2}{3}\vec{v}+\vec{u}$

c) $\overrightarrow{WB}=-\vec{u}+\frac{2}{3}\vec{v}$ $\quad \vec{v}-\vec{u}-\frac{1}{3}\vec{v}=\frac{2}{3}\vec{v}-\vec{u}$

d) $\overrightarrow{AC}=\frac{-2}{6}\vec{v}+\vec{u}+\frac{3}{6}\vec{v}$

$=\vec{u}+\frac{1}{6}\vec{v}$

Collinear

$\xrightarrow[c]{\vec{d}}$ tail to tail one vector on top of each other.

linear ~~Combination~~

Given $\vec{u}$ and $\vec{v}$ are two vectors and s and t are scalars and $\in \mathbb{R}$
$s\vec{u}+t\vec{v}$ is called a linear combination of $\vec{u}$ and $\vec{v}$