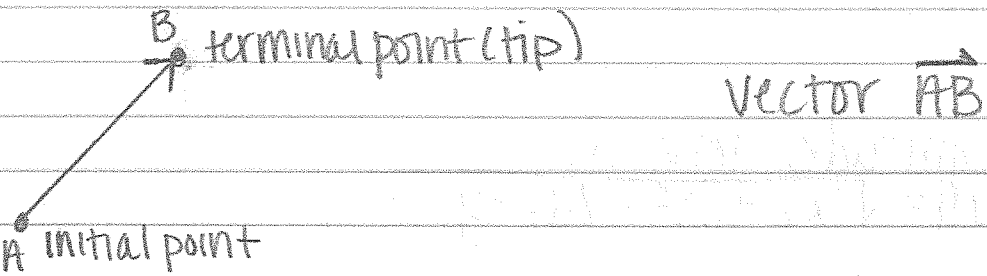
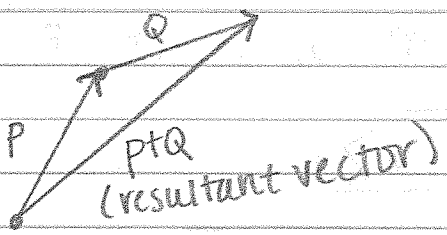
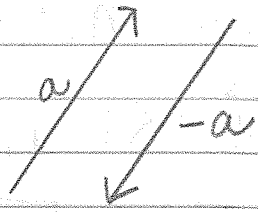
Notes section 8.1-8.2: Vectors

<u>vector</u> - a quantity that has both magnitude and direction

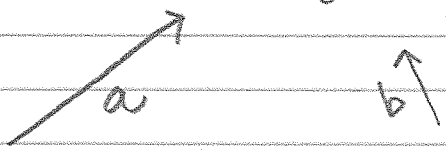


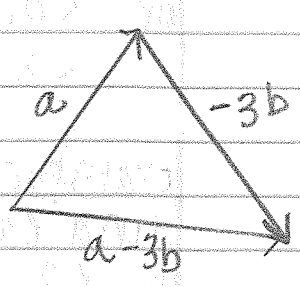
triangle method (tip to tail)



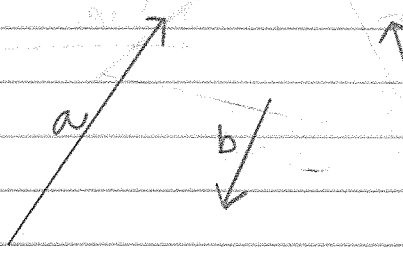


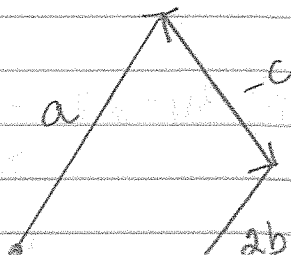
Draw a vector diagram of $a-3b$





Draw a vector diagram of $a-c+2b$



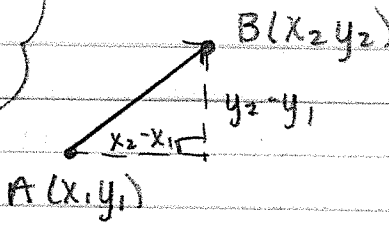


component form of a vector

initial point $A(x_1, y_1)$

terminal point $B(x_2, y_2)$

$\overrightarrow{AB} = \langle x_2 - x_1, y_2 - y_1 \rangle$



magnitude (length)

$||v|| = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

example 1

find the component form of $\overrightarrow{AB}$ with initial point $A(1, -3)$ and terminal point $B(1, 3)$

$\overrightarrow{AB} = \langle 1-1, 3+3 \rangle = \boxed{\langle 0, 6 \rangle}$

$||\overrightarrow{AB}|| = \sqrt{(1-1)^2 + (3+3)^2} = \sqrt{0+36} = \boxed{6}$

or $\langle 0, 6 \rangle = \sqrt{0^2 + 6^2} = \boxed{6}$

$\langle a, b \rangle = \sqrt{a^2 + b^2}$

example 2

find each of the following for

$w = \langle 2, -5 \rangle \quad y = \langle 2, 0 \rangle \quad z = \langle -1, -4 \rangle$

a) $2w + y = 2\langle 2, -5 \rangle + \langle 2, 0 \rangle$

$= \langle 4, -10 \rangle + \langle 2, 0 \rangle = \boxed{\langle 6, -10 \rangle}$

b) $3y - 2z = 3\langle 2, 0 \rangle - 2\langle -1, -4 \rangle$

$= \langle 6, 0 \rangle - \langle -2, -8 \rangle$

$\boxed{= \langle 8, 8 \rangle}$

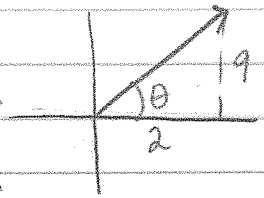
component form: $\langle 2, 6 \rangle$ $\quad i = \langle 1, 0 \rangle$

linear combination: $2i + 6j$ $\quad j = \langle 0, 1 \rangle$

example 3

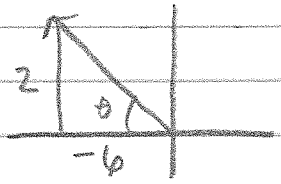
find the direction angle of each vector

a) $\langle 2, 9 \rangle$



$\tan\theta = 9/2$ $\quad \boxed{\theta = 77.471^\circ}$

b) $-6i + 2j$



$\tan\theta = 2/6$

$\theta = 18.435^\circ$

$180 - 18.435 = \boxed{161.565^\circ}$

direction angles

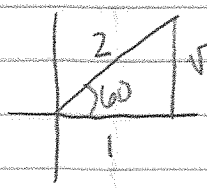
$v = \langle a, b \rangle = \langle \|v\| \cos\theta, \|v\| \sin\theta \rangle$

example 4

find the component form of the vector v with magnitude 7 and direction angle 60°

$\langle 7\cos 60^\circ, 7\sin 60^\circ \rangle$

$\langle 7(1/2), 7(\sqrt{3}/2) \rangle$



$\boxed{\langle 7/2, 7\sqrt{3}/2 \rangle}$