

# Welcome to Math 105

My name is Elyse Yeager

Main Webpage:

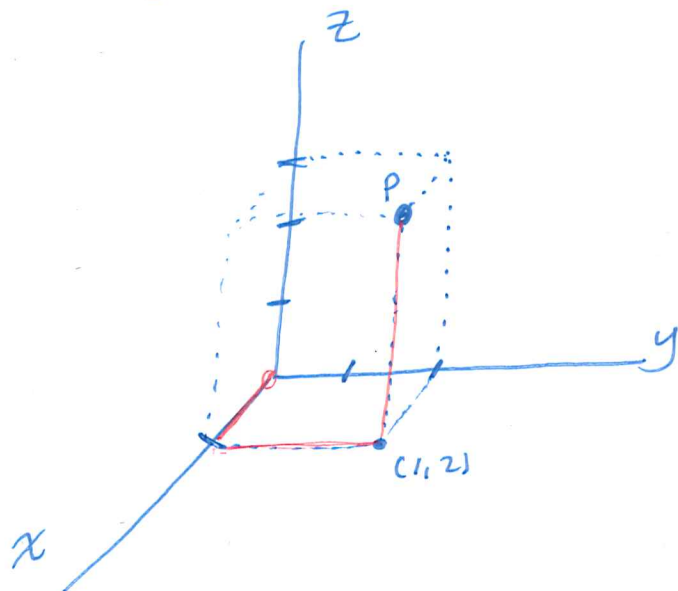
[www.math.ubc.ca/~kliu/common105.html](http://www.math.ubc.ca/~kliu/common105.html)

Section Webpage:

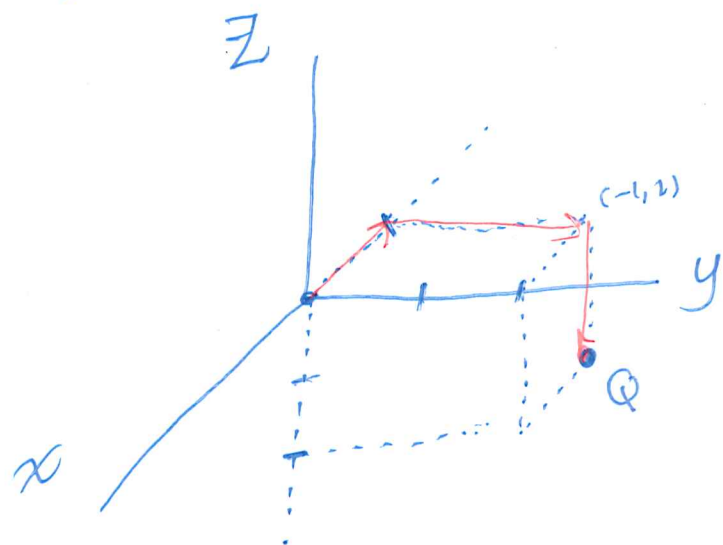
[www.math.ubc.ca/~elyse/2017Math105.html](http://www.math.ubc.ca/~elyse/2017Math105.html)

# Ch. 11.1 - 11.3 Vectors

Drawing points in  $xyz$ -system ( $\mathbb{R}^3$ )



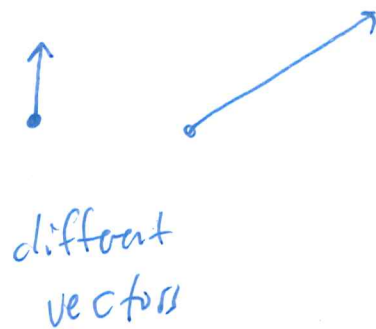
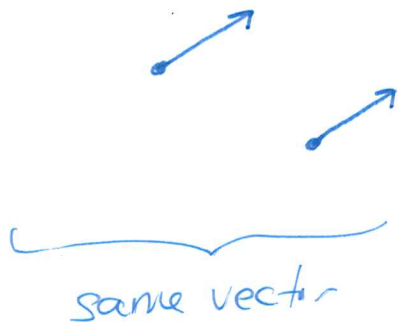
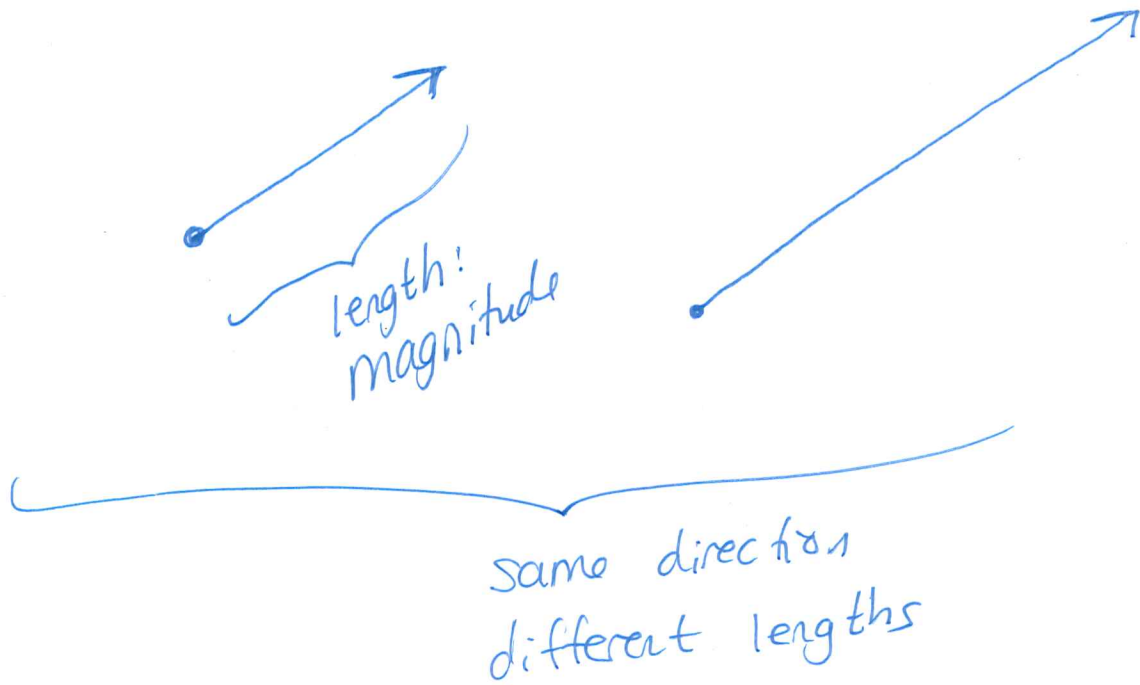
$$P = (1, 2, 3)$$



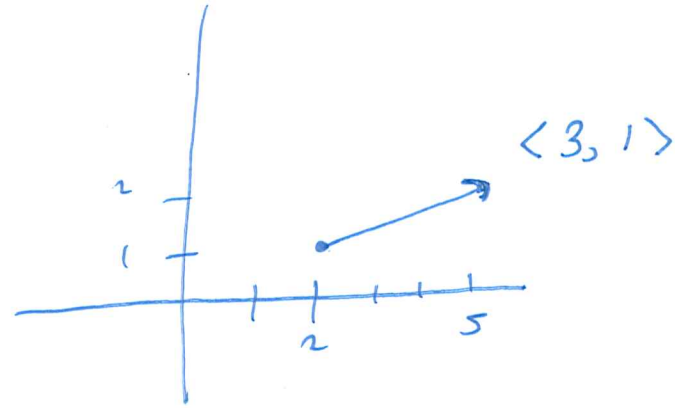
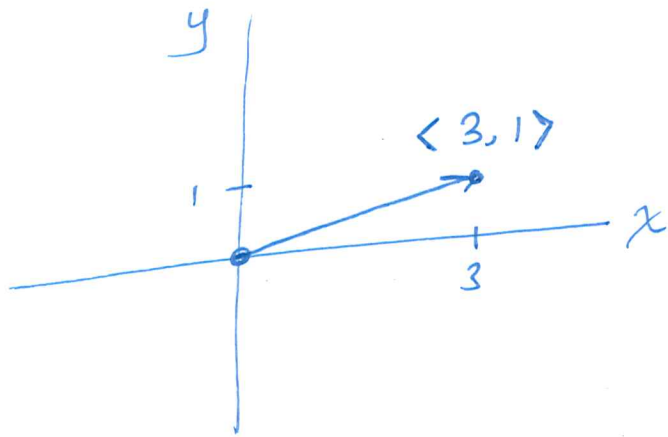
$$Q = (-1, 2, -2)$$

A vector has :

- magnitude (length, size)
- direction

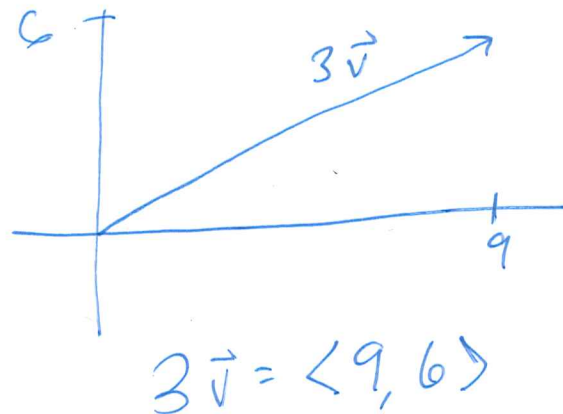
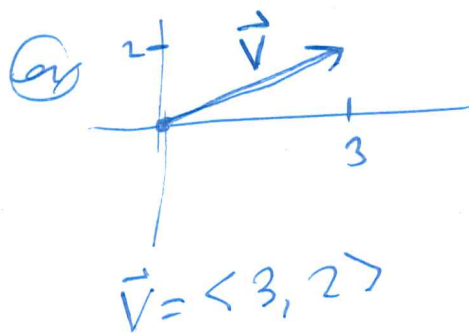


# Naming Vectors



## Multiplying Vectors with Scalars $\hat{=}$ numbers

When we multiply a vector by a positive scalar, the direction stays the same, we multiply the length

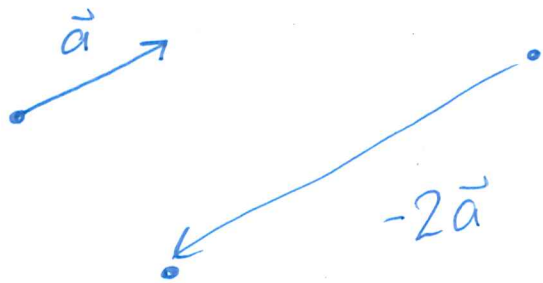


⊙  $5 \langle 5, 7, -1 \rangle = \langle 25, 35, -5 \rangle$

⊙  $-5 \langle 5, 7, -1 \rangle = \langle -25, -35, 5 \rangle$

← number

If we multiply a vector by a negative scalar,  
the vector changes to opposite direction  
(head & tail change places)  
and we multiply the length.

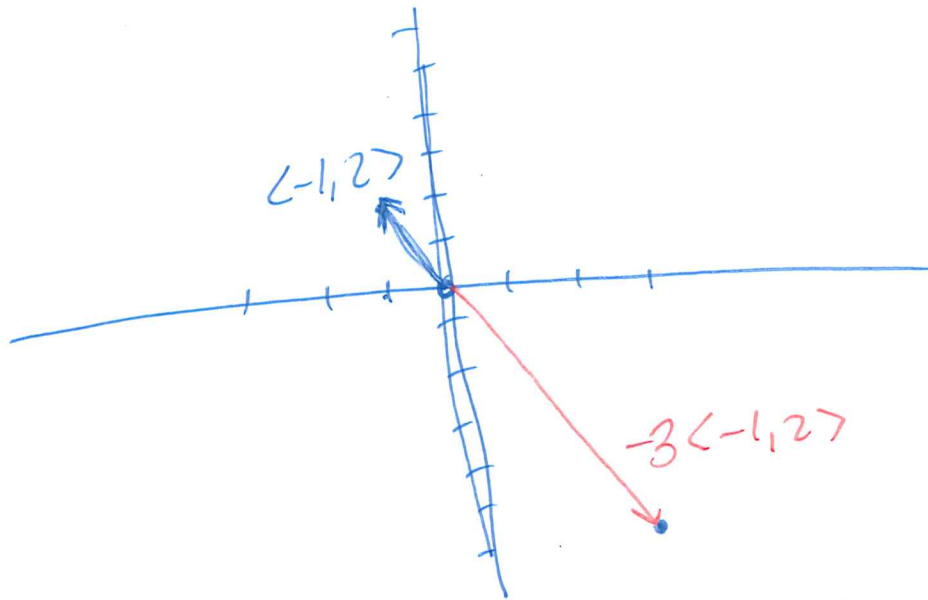


Vectors that are parallel  
(same or opposite directions) are scalar multiples of each other.

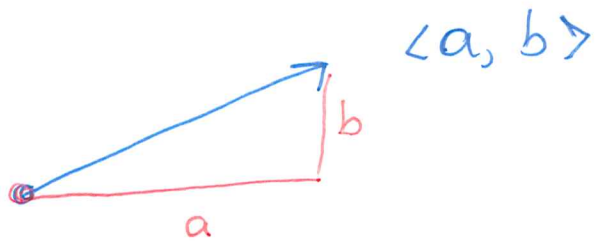
(ex)  $\frac{1}{2} \langle 4, 2, 10 \rangle \Rightarrow \left. \begin{array}{l} \langle 2, 1, 5 \rangle \\ \langle 4, 2, 10 \rangle \\ \langle 10, 5, 17 \rangle \end{array} \right\} 2 \langle 2, 1, 5 \rangle = \langle 4, 2, 10 \rangle$  Which are parallel?

(ex) Calculate + draw:

$$-3 \langle -1, 2 \rangle = \langle 3, -6 \rangle$$



# Length of a Vector



Pythagorean Thm:

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

length of  
 $\langle a, b \rangle$

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

length of  
 $\langle a, b, c \rangle$

ex

$$\vec{w} = \langle 2, -1, 3 \rangle,$$

$$\| \vec{w} \| = \sqrt{4 + 1 + 9} = \sqrt{14}$$