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David Catlin

Math Bldg 744

Office Hours

Tu. 10:30 – 11:30

Th 10:30 – 11:30

F. 9:30 – 10:30

Math 162 Course Page

is at

math.purdue.edu/ma162

Find link for:

1. Assignment Sheet

2. Ground Rules **READ**

3. WebAssign. This is an online Homework System

Students should go to

www.webassign.net/purdue/login.html

Use your ~~Pur~~ Purdue Career Account information to ~~begin~~ login.

If I cover a lesson
on Friday or Monday,
then the WebAssign HW
is due by 11:05 PM on
following Tuesday.

AND If I cover a lesson
on Wed., then the WebAssign
HW is due by 11:05 on
following Thursday

There will be a quiz on the following Thursday or Tuesday

NO LATE HW ACCEPTED

NO LATE QUIZZES.

There is a Help Room in MA 205 (Schedule available

~~Office Hours~~ M - Th

Ground Rules 11:30 - 3:30

Book is Early Transcendentals

7th-Ed., by Stewart

You'll need an access code for WebAssign.

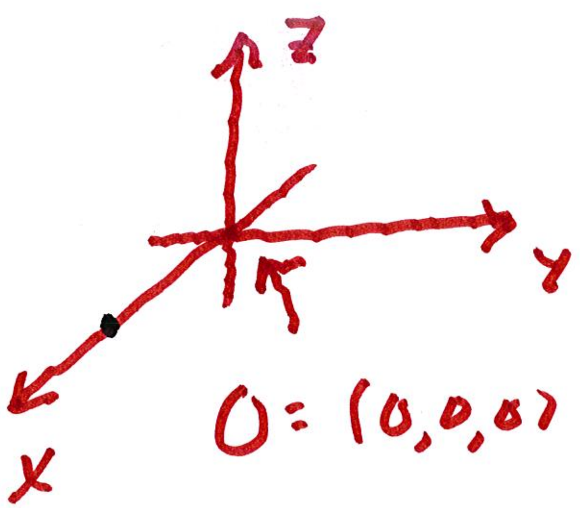
It's free with a new book

It can also be purchased separately.

12.1 3-dimensional Coordinate Systems

$\mathbb{R}^2$ is the set of all ordered pairs (a, b)

Similarly, $\mathbb{R}^3$ is the set of all ordered triples (a, b, c)

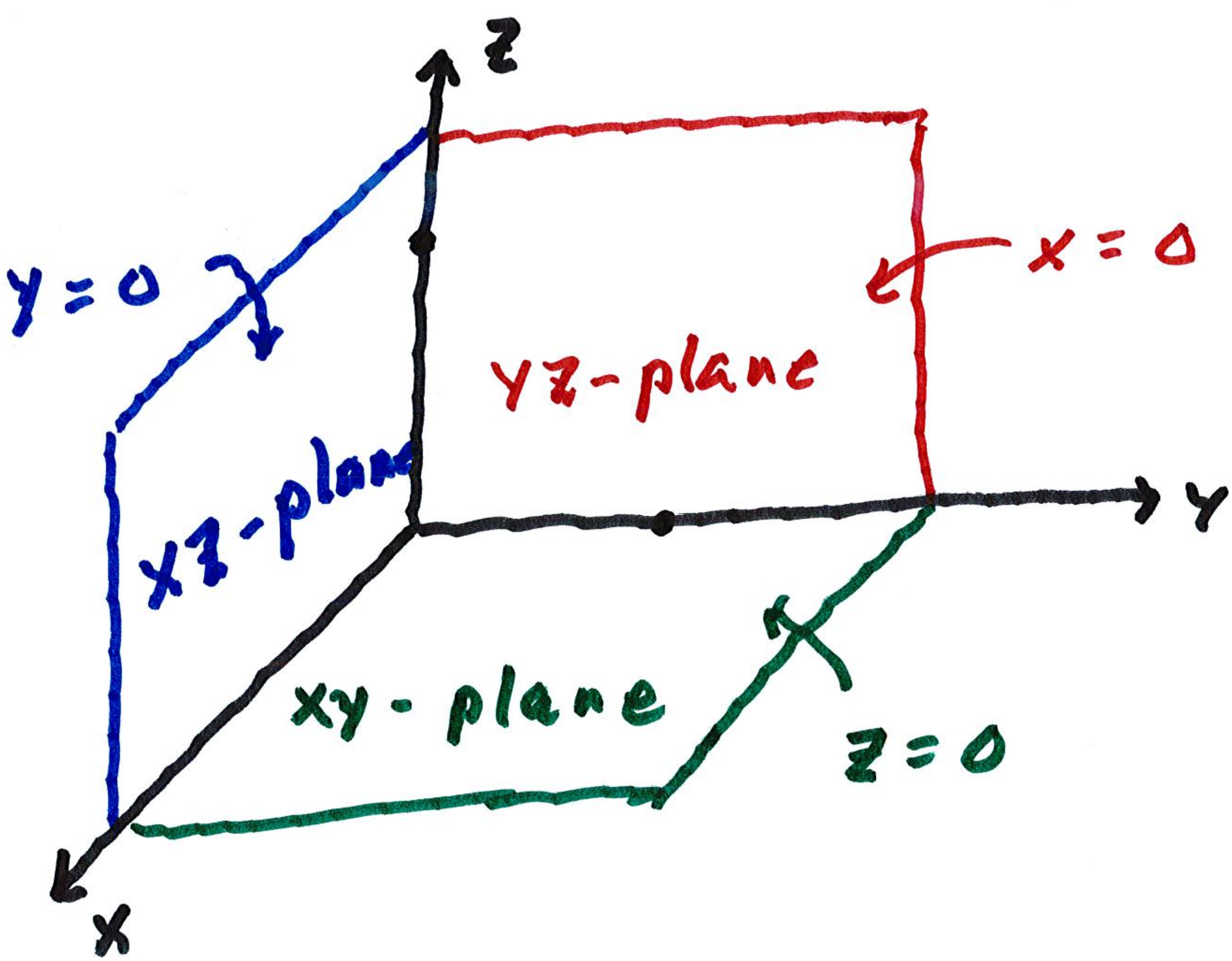


The x-axis is the set of points $(x, 0, 0)$

5.1

The y-axis is the set of points $(0, y, 0)$

The z-axis is the set of points $(0, 0, z)$



Given a point (a, b, c)

(also written $P(a, b, c)$),

a is the x-coord.,

b is the y-coord.,

c is the z-coord.

To represent $P(a, b, c)$

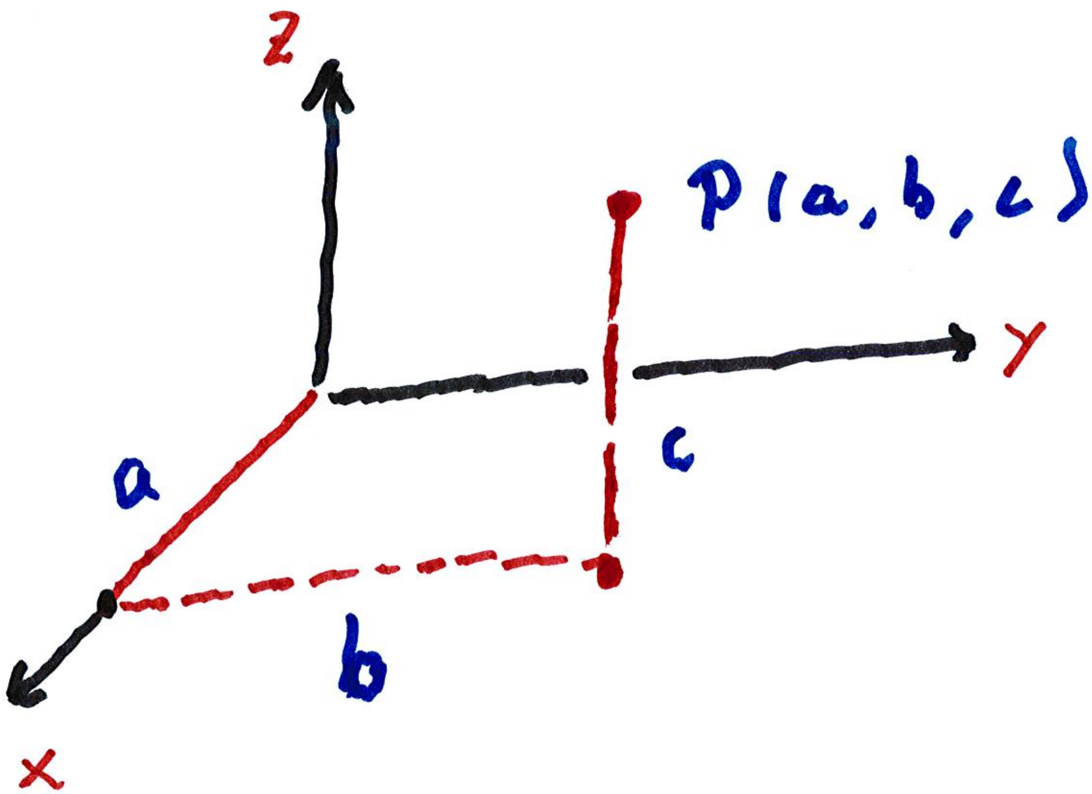
we start at $O = (0,0,0)$

and move

a units along the x-axis,

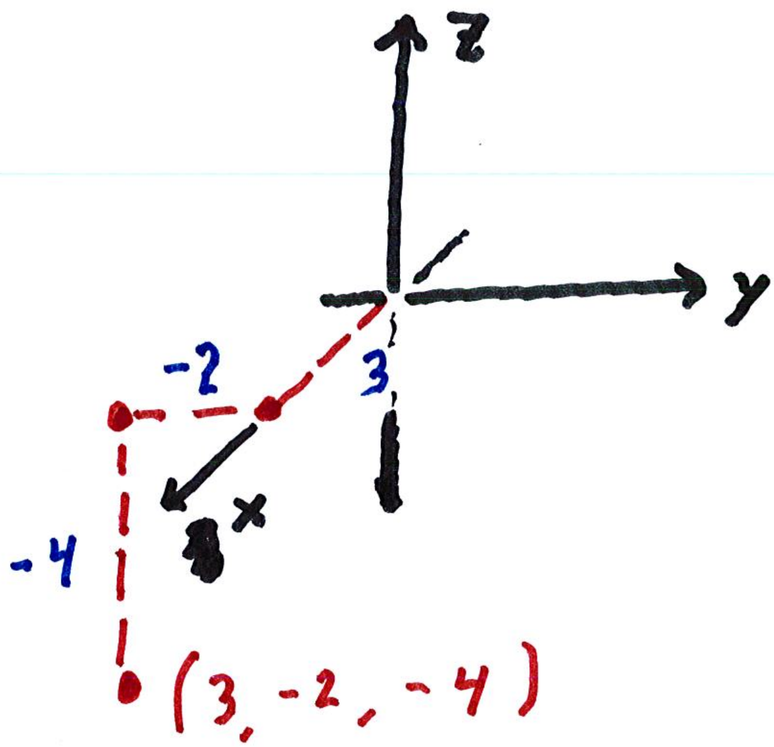
b units parallel to the y-axis,

and c units parallel to the z-axis.

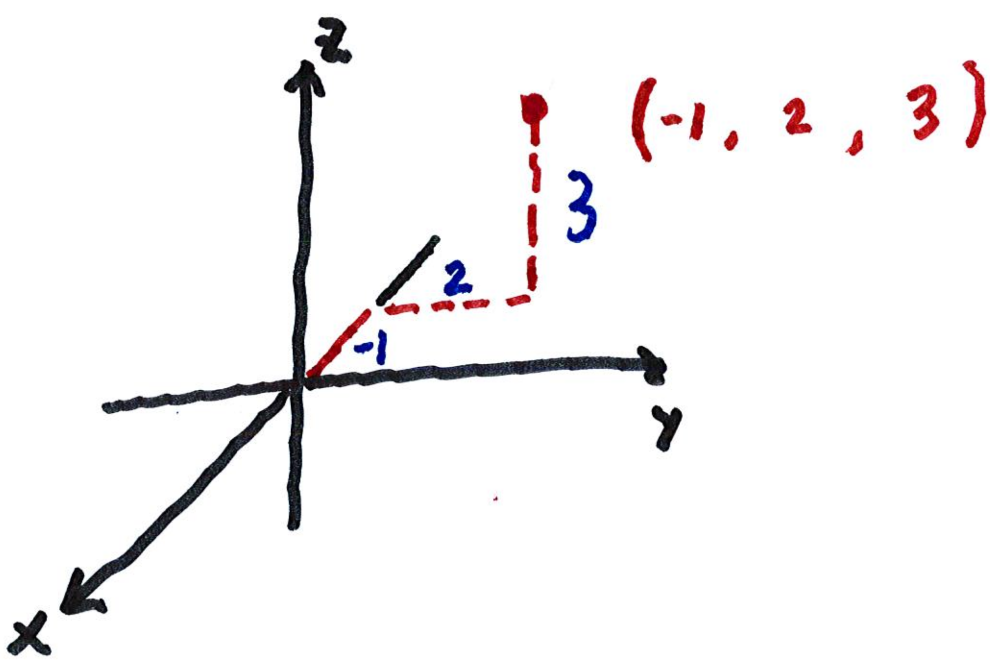


3/1
7,1

Some examples: Plot $(3, -2, -4)$



and $(-1, 2, 3)$

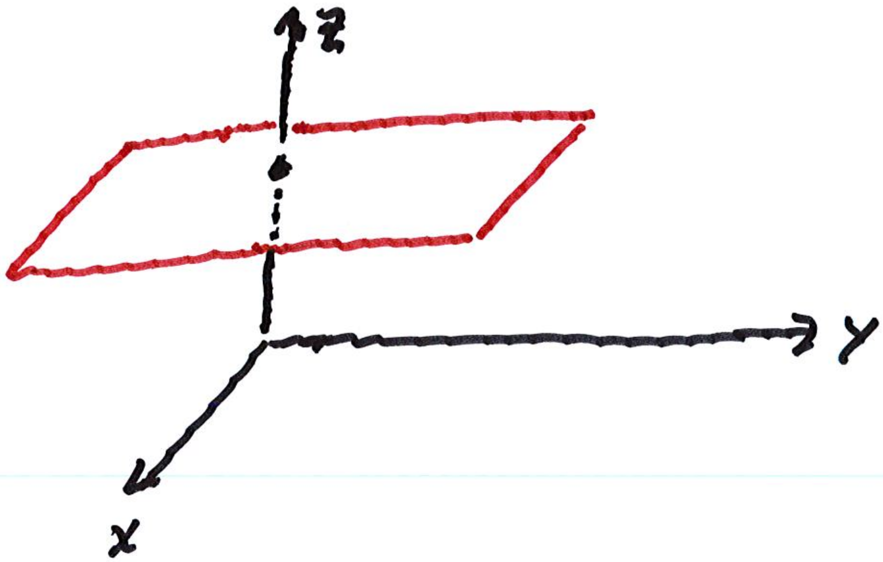


The set of points $P(a, b, c)$ with $a, b, c \geq 0$ is the <u>first</u> <u>octant</u>.

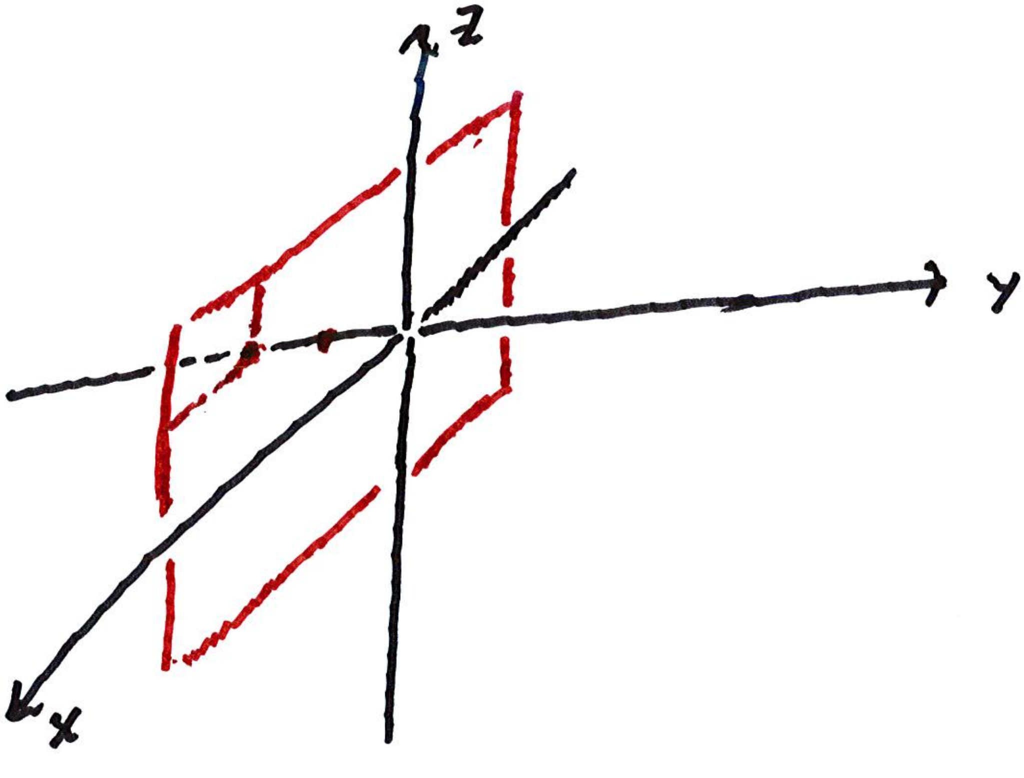
Surfaces

Describe geometrically the set of points with:

a. $z = 2$ Note the values of x and y are <u>not</u> restricted.

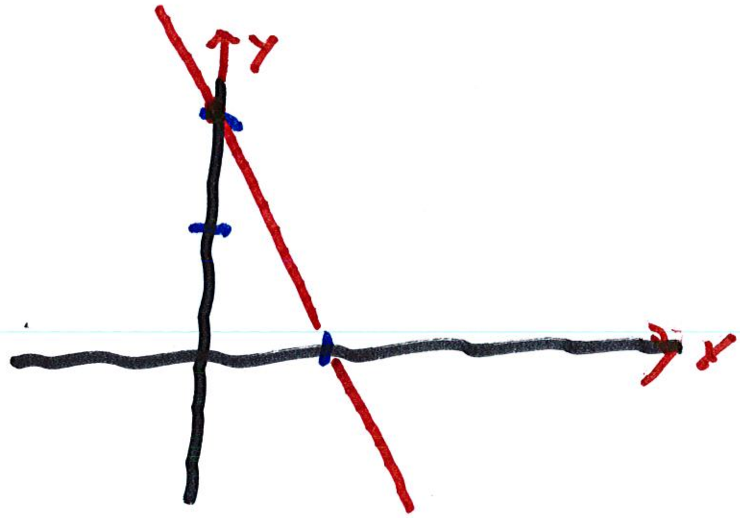


b. Sketch $y = -2$

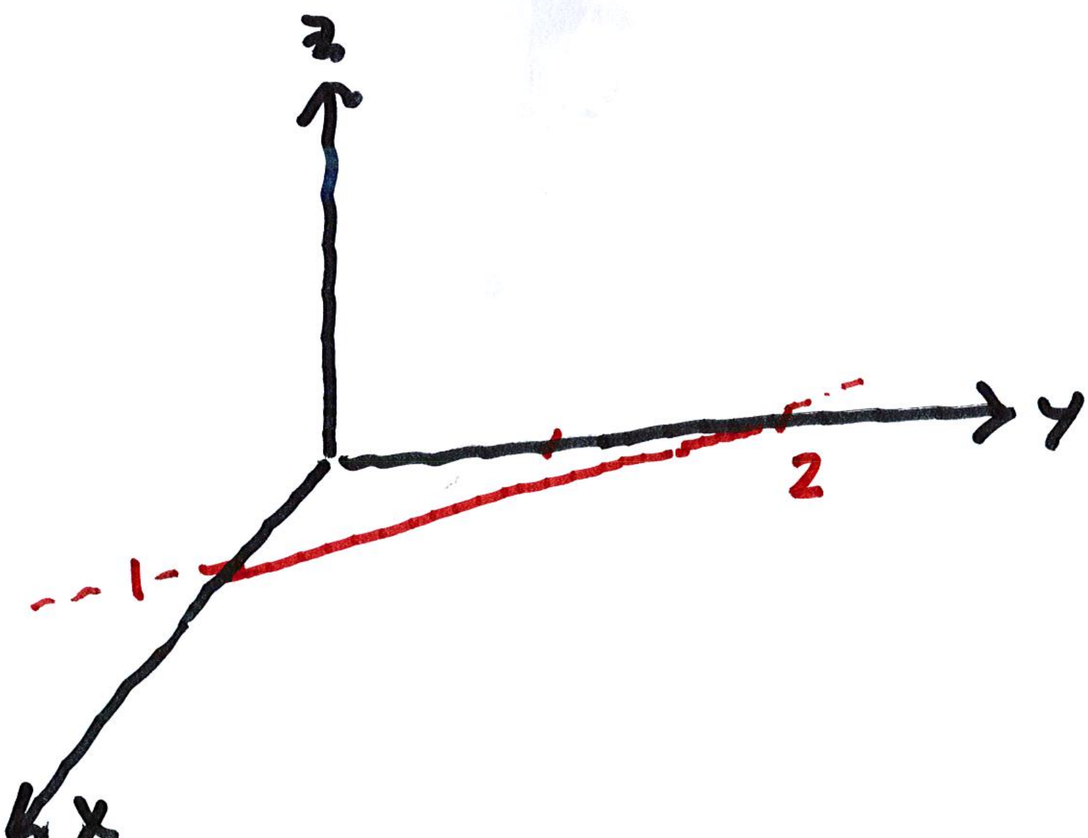


c. $y + 2x = 2$

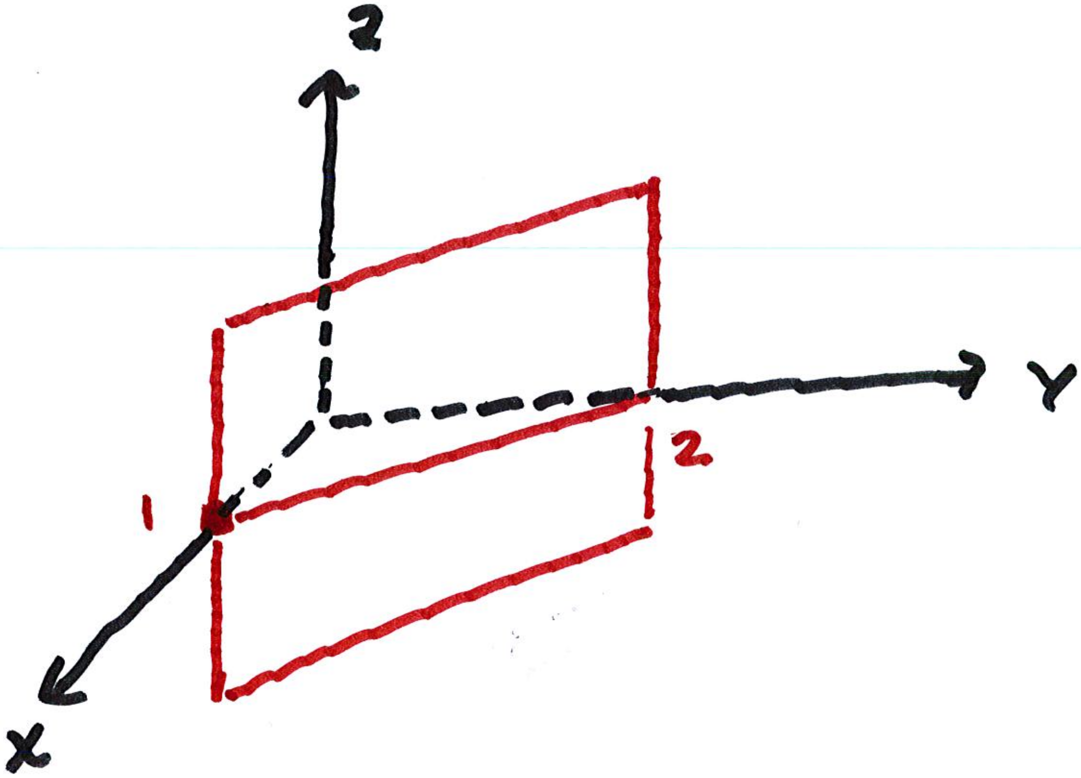
In $\mathbb{R}^2$,



In $\mathbb{R}^3$, with $z = 0$



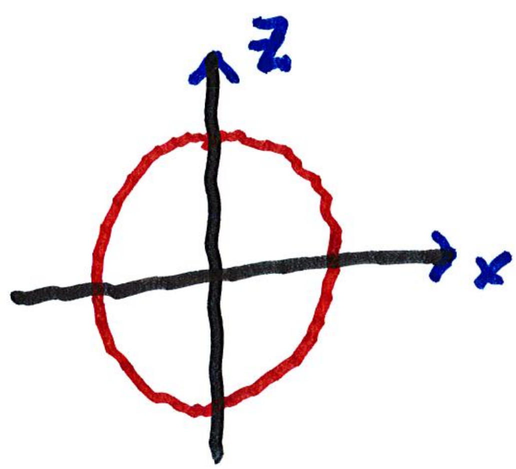
Now let z have any value:



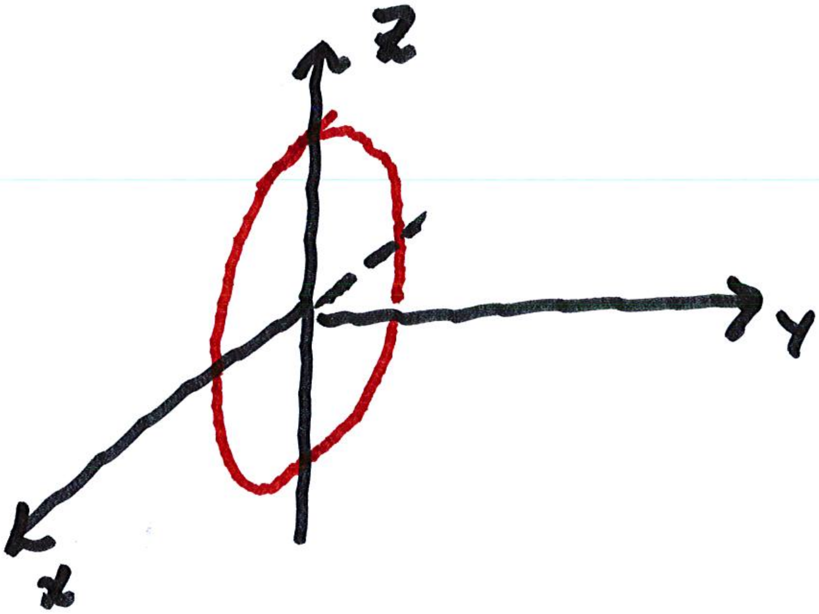
d. Describe the surface

$x^2 + z^2 = 1$

In the xz-plane:

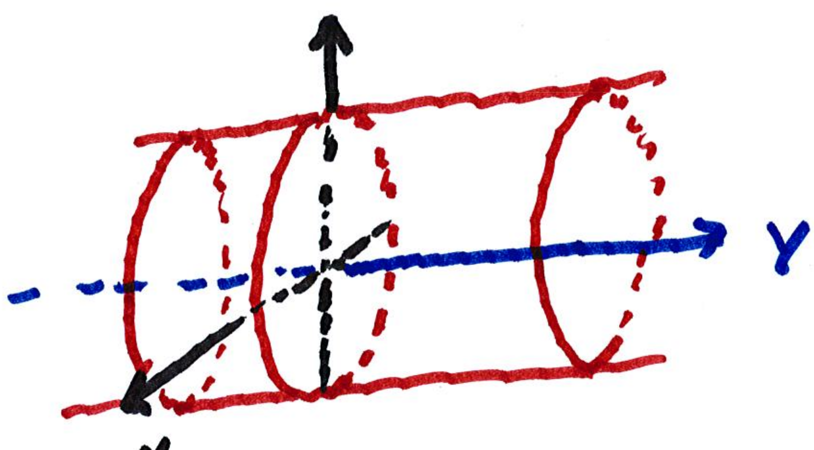


If $y = 0$, then we get



Now let y have any value

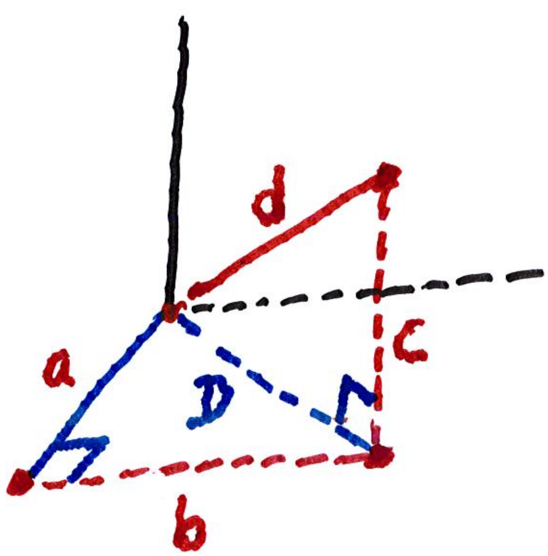
(slide circle parallel to y-axis)



A cylinder of radius 1 about y-axis

Distance Formula in 3 Dimensions

Find the distance of (a, b, c) from $(0, 0, 0)$



$$a^2 + b^2 = D^2$$

$$D^2 + c^2 = d^2$$

$$\therefore \quad a^2 + b^2 + c^2 = d^2$$

$$\therefore \quad d = \sqrt{a^2 + b^2 + c^2}$$

More generally, if

$P_1 = (x_1, x_1, z_1)$ and

$P_2 = (x_2, y_2, z_2)$,

then $|P_1P_2|$ = distance of P_1 to P_2, and

$$\cancel{|P_1P_2| = \sqrt{(x_2 - x_2)^2 + (}}$$

$$|P_1P_2| = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2}$$

10.4

Ex. Calculate the distance of

$P(2, 4, -1)$ from $P(-1, 6, 3)$

$$d = \sqrt{(2-(-1))^2 + (4-6)^2 + (-1-3)^2}$$

$$= \sqrt{3^2 + 2^2 + 4^2}$$

$$= \sqrt{29}$$

Equation of a Sphere

When is the distance of (x, y, z) from (a, b, c) equal to r

$$\sqrt{(x-a)^2 + (y-b)^2 + (z-c)^2} = r$$

OR

$$(x-a)^2 + (y-b)^2 + (z-c)^2 = r^2$$

Ex. Find the center and radius of the sphere

$$x^2 + y^2 + z^2 - 2x + 4y + 6z = -10$$

Group terms:

$$x^2 - 2x \quad + y^2 + 4y \quad + z^2 + 6z = -10$$

Complete the square:

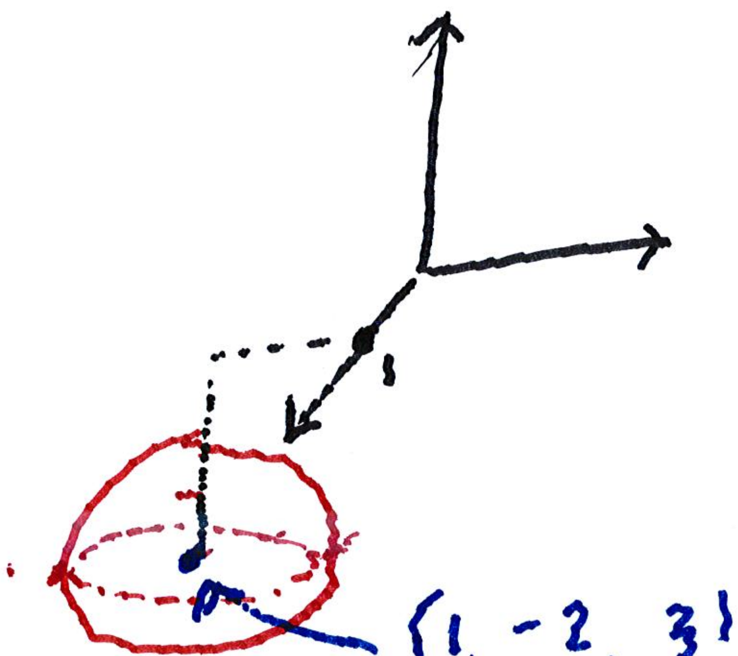
$$(x-1)^2 + (y+2)^2 + (z+3)^2 = -10$$

$$+1+4+9$$

$$= 4$$

Center = $(1, -2, -3)$

Radius = 2



12.2 Vectors

A vector is a quantity that has both <u>magnitude</u> and <u>direction</u> (such as <u>displacement</u>, <u>velocity</u> or <u>force</u>)

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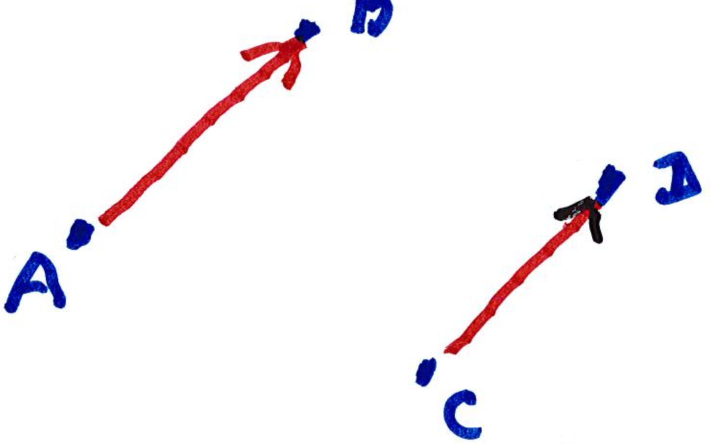
If a particle moves from A to B, the displacement vector is $\overrightarrow{AB}$



We say the vectors

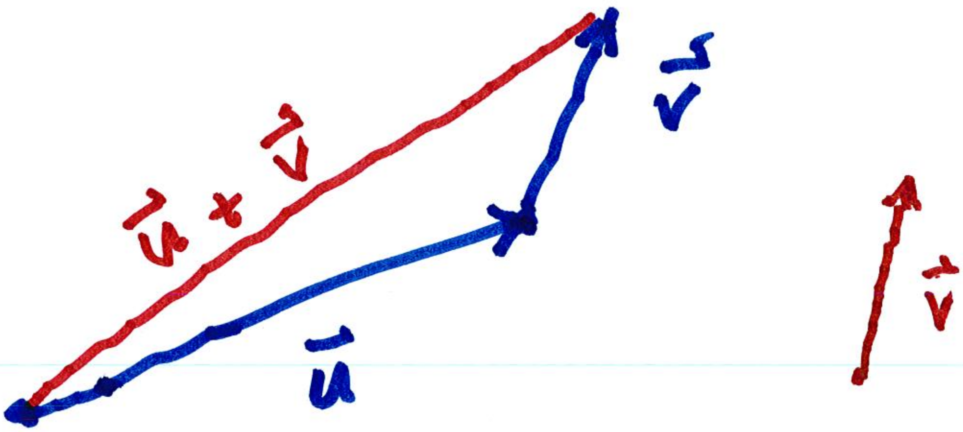
$\overrightarrow{AB}$ and $\overrightarrow{CD}$ are

equivalent (same magnitude and direction)

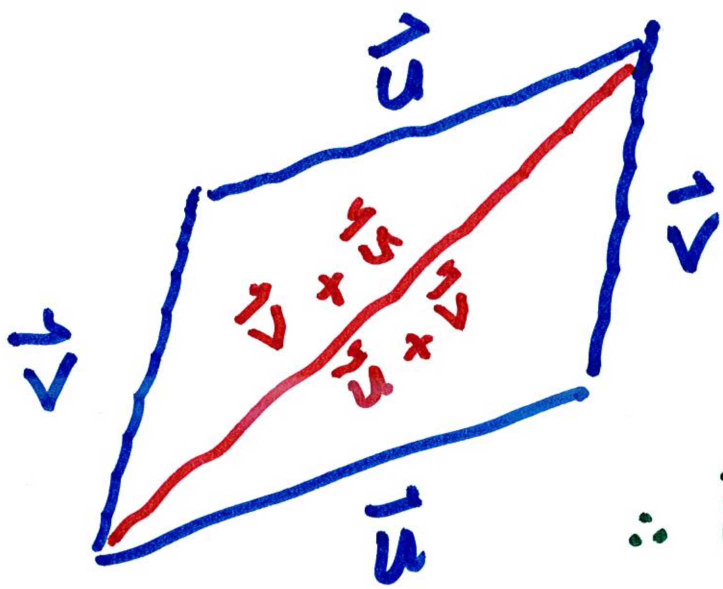
For $\overrightarrow{AB}$, A is the initial pt. and B is the terminal pt.

Vector Addition

If the initial point of $\vec{v}$ is the terminal point of $\vec{u}$, then $\vec{u} + \vec{v}$ is the vector with initial point of $\vec{u}$ and the terminal pt. of $\vec{v}$

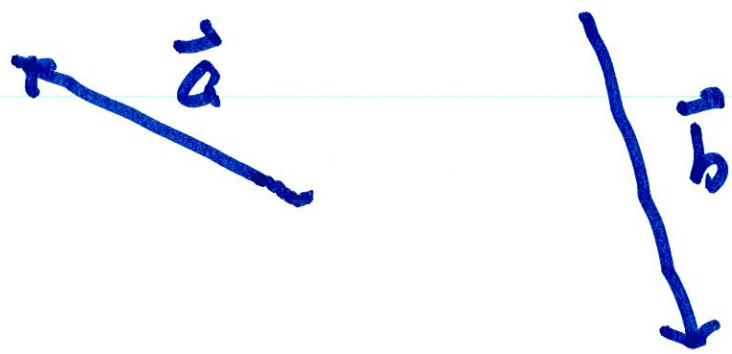


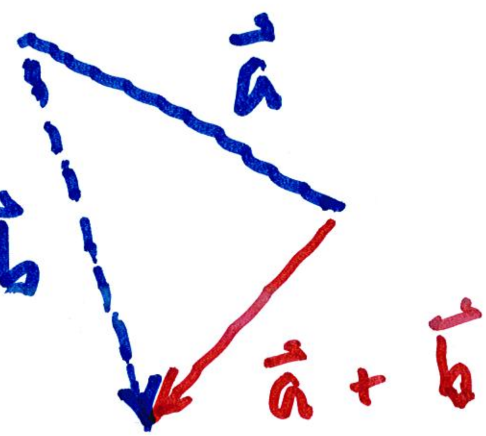
We can form a parallelogram



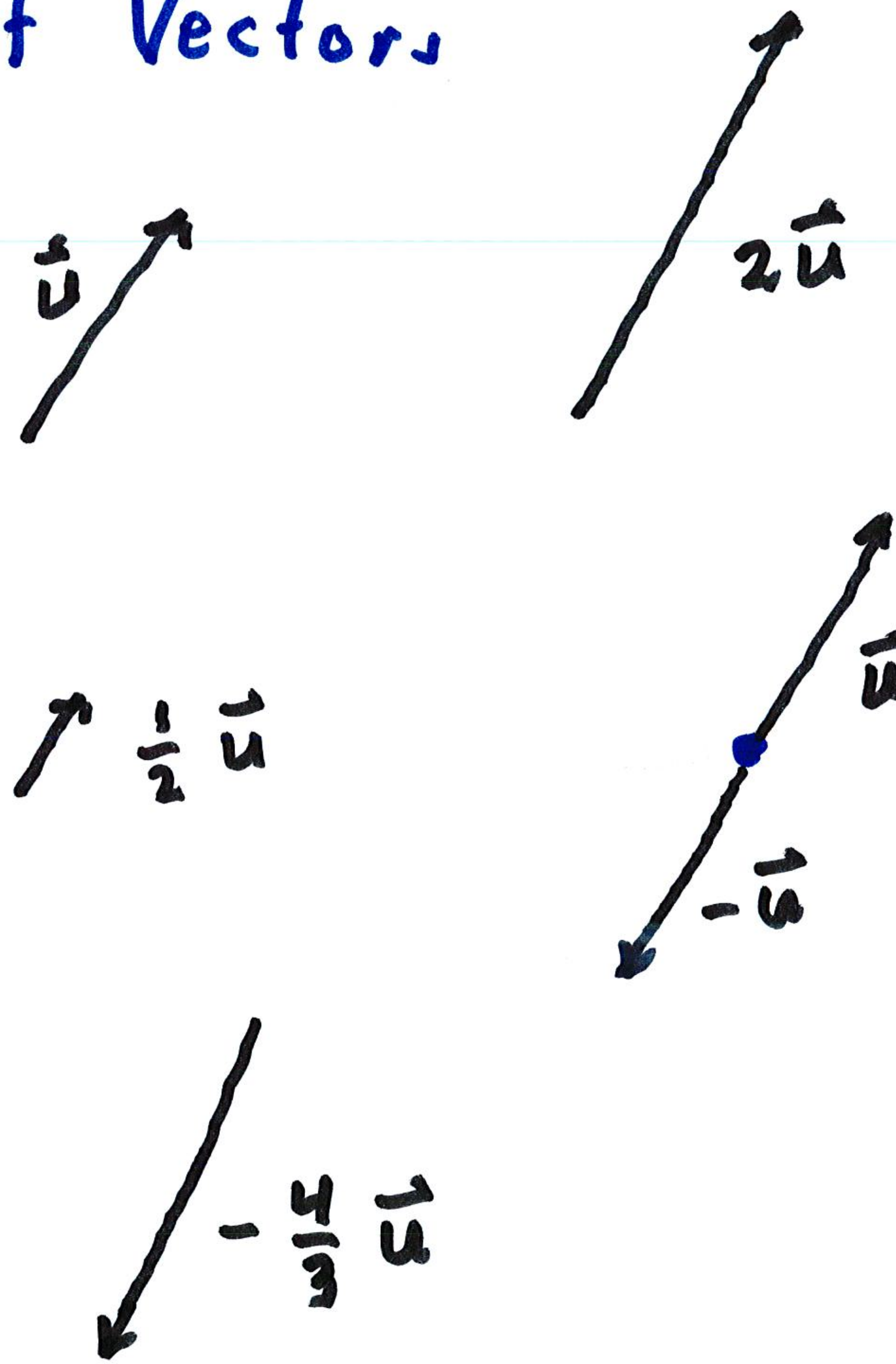
$\therefore \vec{u} + \vec{v} = \vec{v} + \vec{u}$

Draw the sum of $\vec{a}$ and $\vec{b}$





Scalar Multiplication of Vectors



We can define $c\vec{u}$ for any vector $\vec{u}$ and any number c.

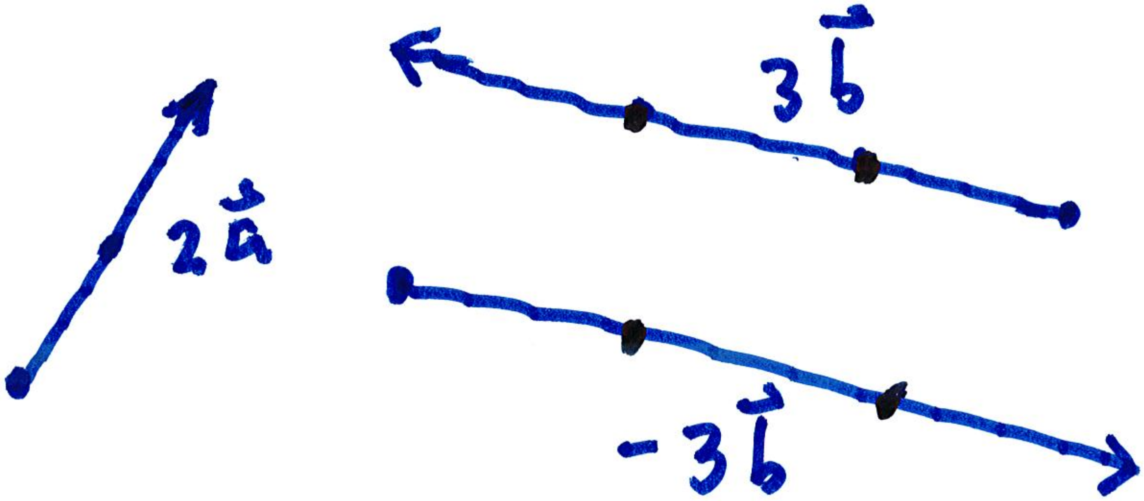
If $c < 0$, then ~~the~~ $c\vec{u}$ points in the opposite direction of $\vec{u}$

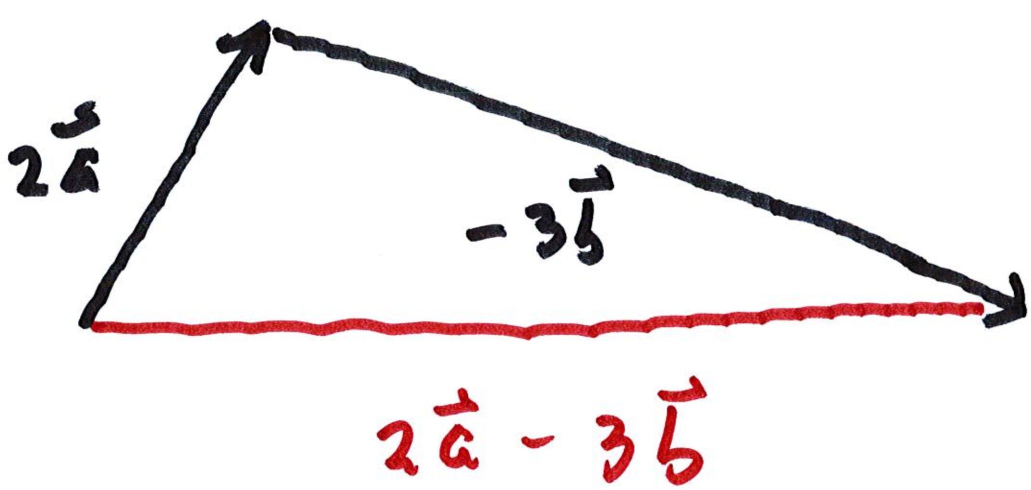
The length of $c\vec{u}$ is $|c|$ times length of $\vec{u}$

Ex. If $\vec{a}$ and $\vec{b}$ are

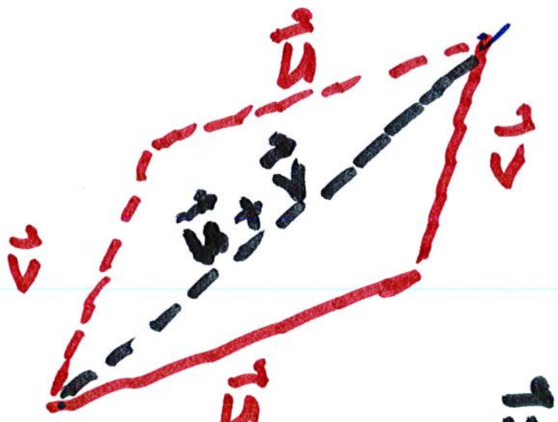
as

sketch $2\vec{a} - 3\vec{b}$





Geometric Meaning of $\vec{u} + \vec{v}$



$$\vec{u} + \vec{v} = \vec{v} + \vec{u}$$

(Parallelogram Law)

Scalar Multiplication