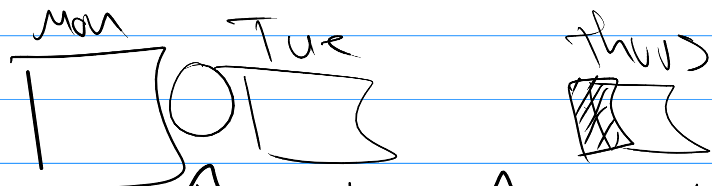
Math 243

Syllabus

Free and online tools

Maxima.sf.net
live.sympy.org
wims.unice.fr

Study Habits



10.3/10.4 10.5/10.6

Fri → Sun

Do Math!

Read 10.3/10.4
Do examples

Days
10.3/10.4/10.5/10.6 HW

(+) Reading ahead

Why no cheat sheets?

$$\frac{d}{dx}\left[\sin^3(x^2+3)\sqrt{x^2+1}\right]$$

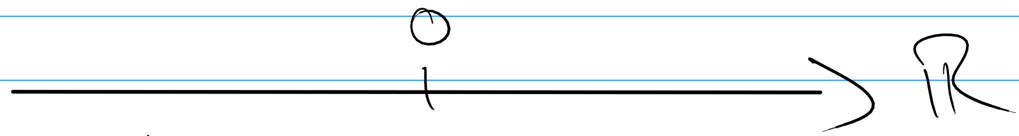
product Rule → chain rule → sum rule → trig rule → power rule

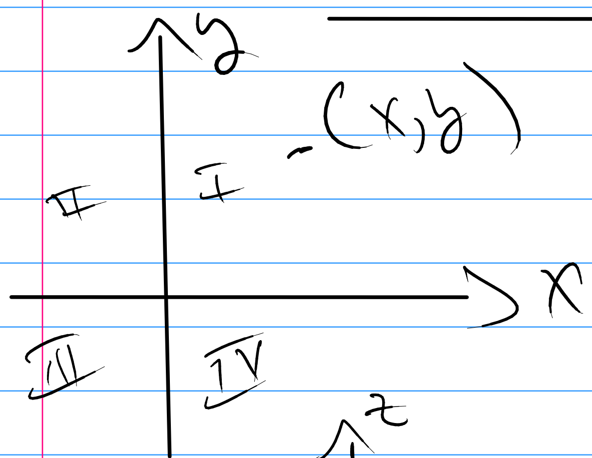
$$\frac{d}{dx}\left[\sin^3(x^2+3)\sqrt{x^2+1}\right]$$

$$6x\sin^2(x^2+3)\cos(x^2+3)\sqrt{x^2+1}$$
$$+\ \sin^3(x^2+3)\,\frac{1}{\cancel{2}}(x^2+1)^{-1/2}(\cancel{2}x)$$

= ~ do at home)

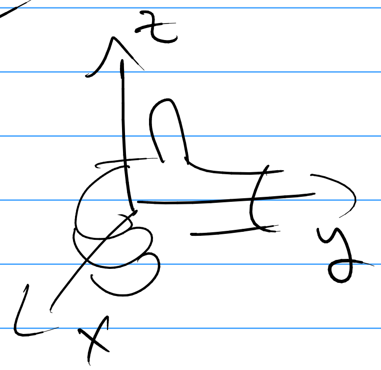
10.1



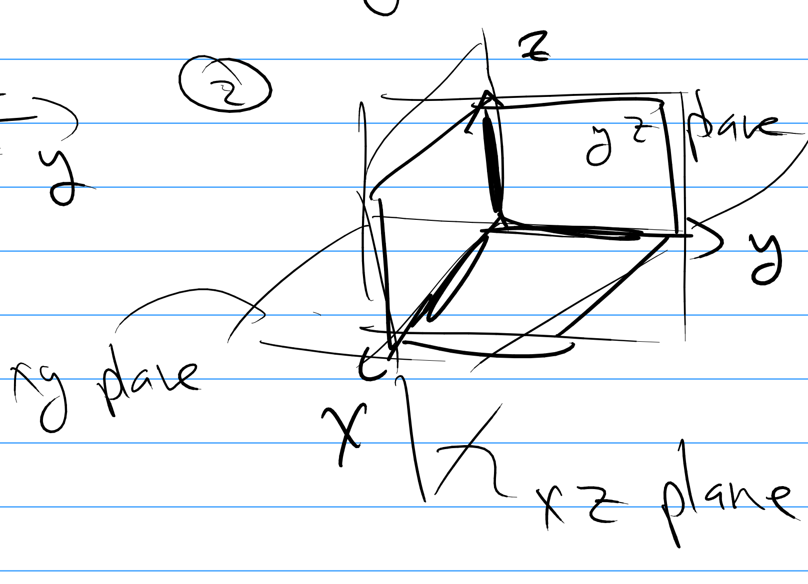


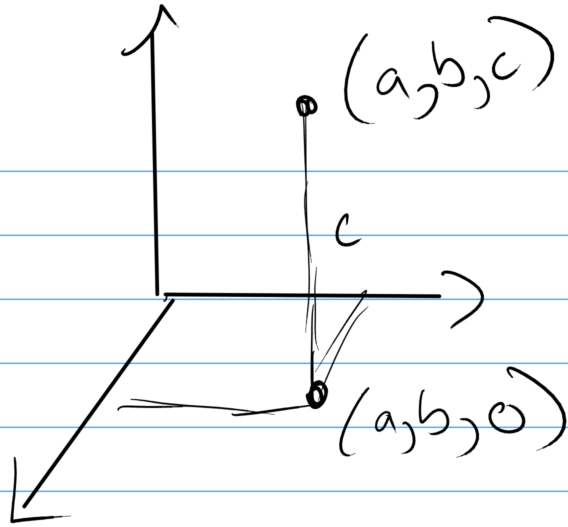
3D

① right-hand rule



②

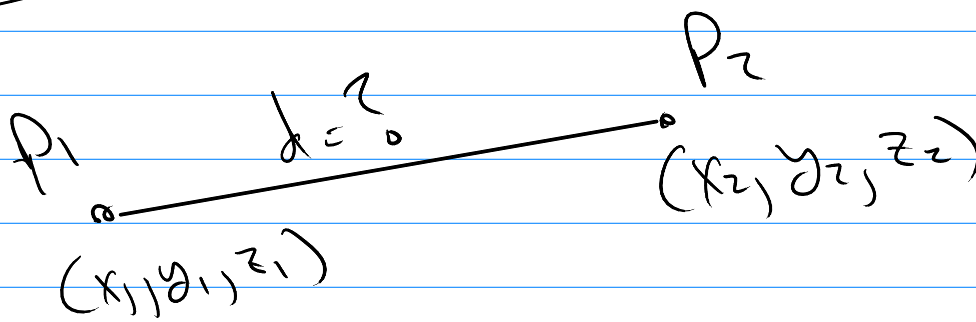




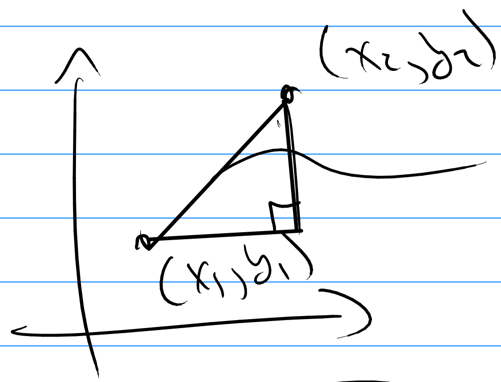
— coordinate triple

← projection onto xy-plane

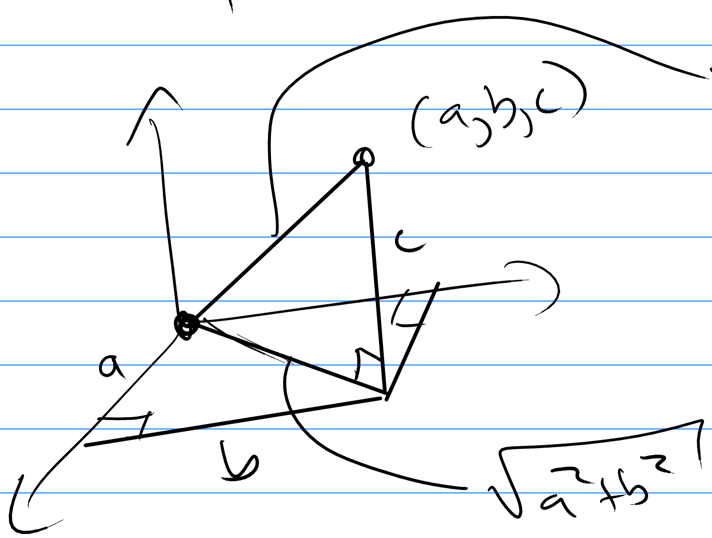
Q's on 3D space.



2D



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

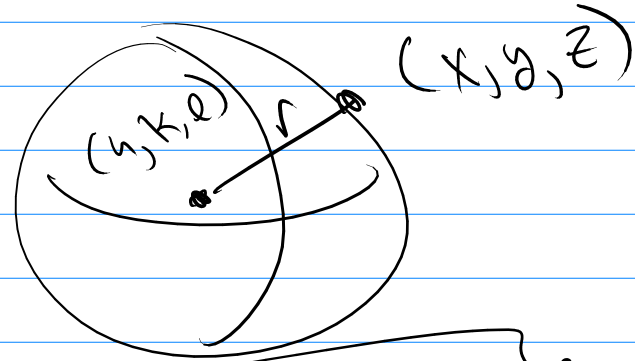


$$d = \sqrt{a^2+b^2+c^2}$$

3D

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

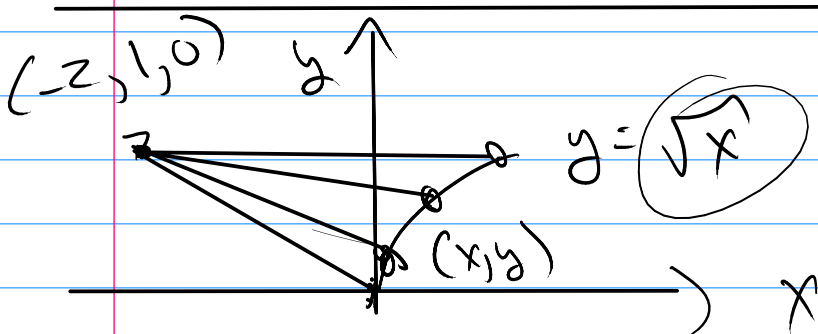
2D



Solve: $\sqrt{(x-h)^2+(y-k)^2+(z-l)^2} = r$

eqn of a sphere

$$(x-h)^2+(y-k)^2+(z-l)^2 = r^2$$



$$D = d^2 = \left((x+2)^2+(y-1)^2\right)$$

$$D(x) = (x+2)^2+(\sqrt{x}-1)^2$$

minimize.

etc.

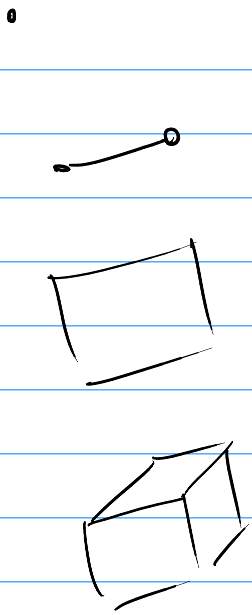
x, y, z, t, s

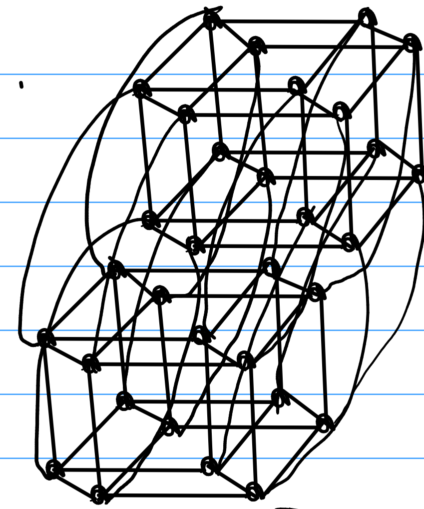
0D

1D

2D

3D





5D cube

Vectors.

Math = Toys + Rules to Play

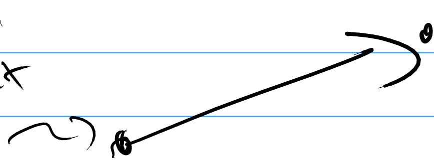
Arithmetic. {1, 2, 3 ...} — Add, Subtract, etc.
equality

Vectors: two component objects.

one = direction (two valued)
two = magnitude

1D

Initial point



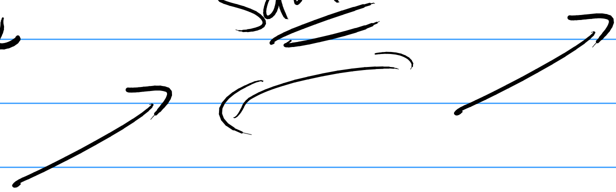
terminal point

Notation: $\mathbf{v}$ bold face or $\vec{v}$

Special vector: $\vec{0}$

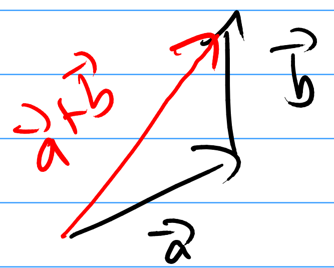
Rules to Play:

① equal: same



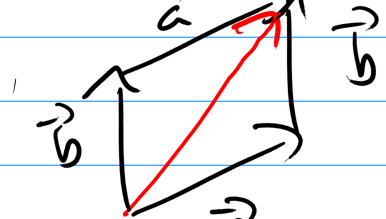
$\vec{a} = \vec{b}$ is same direction and same magnitude

② Add: $\vec{a} + \vec{b}$



attach terminal of $\vec{a}$ to initial of $\vec{b}$ and $\vec{a}+\vec{b}$ is a new vector from initial of $\vec{a}$ to terminal of $\vec{b}$

triangle law



$\vec{a} + \vec{b} = \vec{b} + \vec{a}$

parallelogram law

② Scalar Multiplication $c \in \mathbb{R}$ ← element of

$c\vec{a}$ new vector of new length $|c|$ times length of $\vec{a}$ and direction of ...

a) if $c > 0 \rightarrow$ same direction

b) if $c < 0 \rightarrow$ opposite direction

c) if $c = 0$ or $\vec{a} = \vec{0}$

$\Rightarrow c\vec{a} = \vec{0}$

③ $\vec{a} - \vec{b} = \vec{a} + (-1 \cdot \vec{b})$

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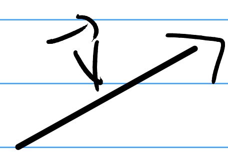
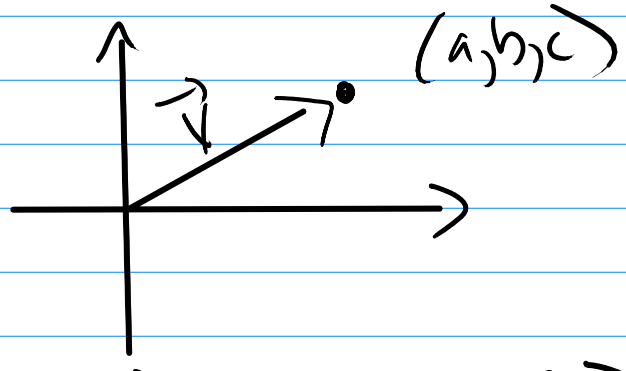
others way to look at $\vec{v}$

a) components





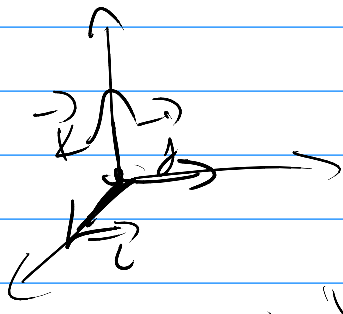
$\vec{v} = \langle a, b, c \rangle$

$\vec{a} = \langle a_1, a_2, a_3 \rangle$ $\vec{b} = \langle b_1, b_2, b_3 \rangle$

$\vec{a} + \vec{b} = \langle a_1 + b_1, a_2 + b_2, a_3 + b_3 \rangle$

Unit vectors: $\vec{i} = \langle 1,0,0\rangle$ $\quad \vec{j} = \langle 0,1,0\rangle$

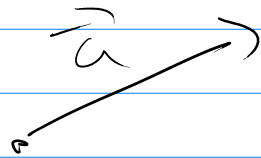
$\vec{k} = \langle 0,0,1\rangle$



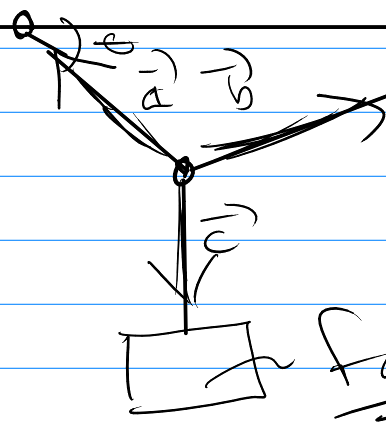
$\vec{a} = \langle a_1, a_2, a_3\rangle$

$$\boxed{\vec{a} = a_1\vec{i} + a_2\vec{j} + a_3\vec{k}}$$

unit vector representation of $\vec{a}$



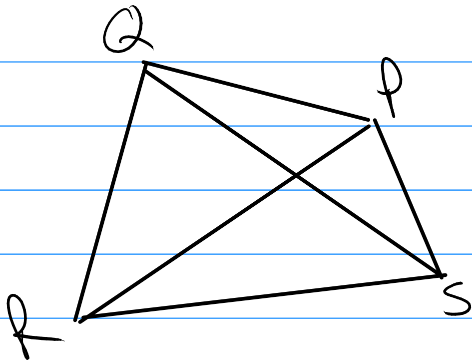
example:



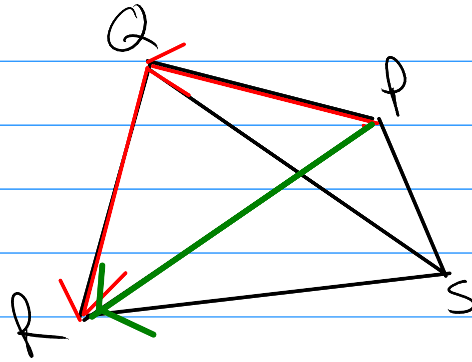
$\vec{a} + \vec{b} = \vec{c}$

force.

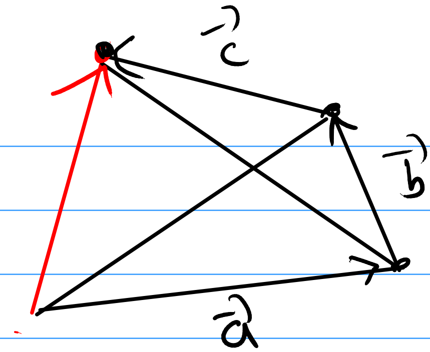
10/12 (2)



a) $\vec{PQ} + \vec{QR} = \vec{PR}$



(31)



$$(\vec{a}+\vec{b})+\vec{c}$$

$$\vec{a}+(\vec{b}+\vec{c})$$

$$\left(\langle a_1, a_2\rangle + \langle b_1, b_2\rangle\right) + \langle c_1, c_2\rangle$$

$$= \langle a_1+b_1,\ a_2+b_2\rangle + \langle c_1, c_2\rangle$$

$$= \langle (a_1+b_1)+c_1,\ (a_2+b_2)+c_2\rangle = \langle a_1+(b_1+c_1),\ a_2+(b_2+c_2)\rangle$$

$$= \langle a_1, a_2\rangle + \langle b_1+c_1,\ b_2+c_2\rangle$$

$$= \langle a_1, a_2\rangle + \left(\langle b_1, b_2\rangle + \langle c_1, c_2\rangle\right)$$