Math 2210-3
Monday Jan 29
11.4 - 11.5 - 11.6

Postpone §11.5 HW until next week
(So, Class exercise labc, §11.3, 11.4
are due at the start of class Wed.)
Remember optional problem session
Tues 10:45 - 11:45 SW 134

Recall cross product definition: $\vec{u} \times \vec{v} =$

then finish Friday notes about the algebra & geometry of cross product, p2-5

then,

Example 1

Consider points

$P = (1, 0, 3)$
$Q = (0, 1, 1)$
$R = (2, 1, 0)$

ⓐ Find the equation of a plane thru these 3 points
ⓑ Find the area of the triangle having P, Q, R as vertices

begin
11.5 : vector-valued functions and parametric curves
11.6 : lines and planes in space

<u>parametric lines</u> (in $\mathbb{R}^2$)

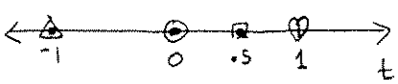
$x = x_0 + at$
$y = y_0 + bt$
(t any real number)
i.e. the parameter

<u>Example</u> 2

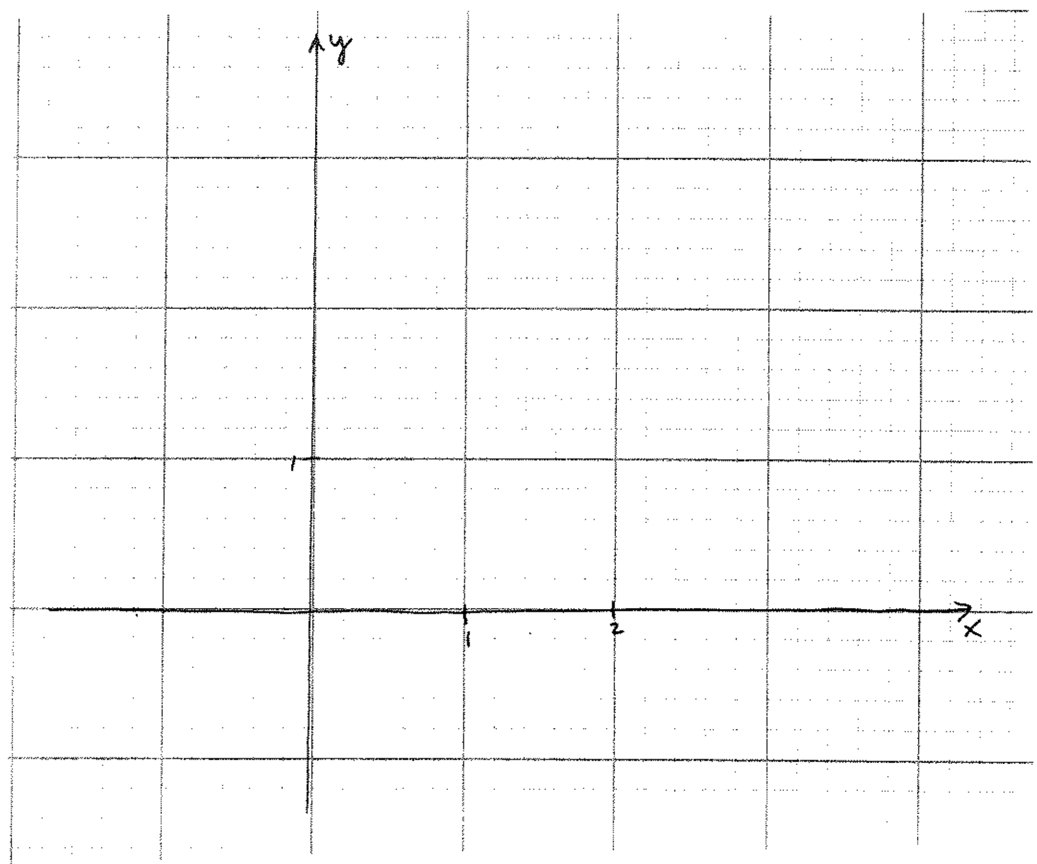
Compute and plot the points (x, y), for the indicated t-values,

for the line

$$\boxed{\begin{aligned} x &= 1 + 3t \\ y &= 2 + t \end{aligned}}$$



inputs
(domain)



outputs
(range)

For any point P, the vector $\overrightarrow{OP}$ from the origin to P is called the <u>position vector</u> of P
We often write a parametric line (or curve) by expressing a formula for the position vector $\vec{F}(t)$, e.g.

$$\boxed{\vec{F}(t) = \langle 1, 2\rangle + t\langle 3, 1\rangle}$$

for the line in example 2.
We call $\langle 3, 1\rangle$ the (a) <u>direction vector</u> for this particular line

<u>Example</u> 3 Add the four position vectors for the points you found in 2
(Of course, usually when we sketch the line we just sketch the endpoints of the position vectors!!)

<u>Example 4</u> : Find the slope-intercept form of the line in 2 by solving simultaneously for t in each equation.

Lines in $\mathbb{R}^3$

given parametrically by

$$x = x_0 + at$$
$$y = y_0 + bt$$
$$z = z_0 + ct$$

or, by expressing the position vector

$$\vec{r}(t) = \langle x_0, y_0, z_0 \rangle + t\,\langle a, b, c \rangle$$

$\langle x_0, y_0, z_0 \rangle$: a point on the line

$\langle a, b, c \rangle$: direction vector

<u>Example 5</u>

Find a parametric expression for the line thru $P = (0,0,1)$ and $Q = (-1,2,2)$