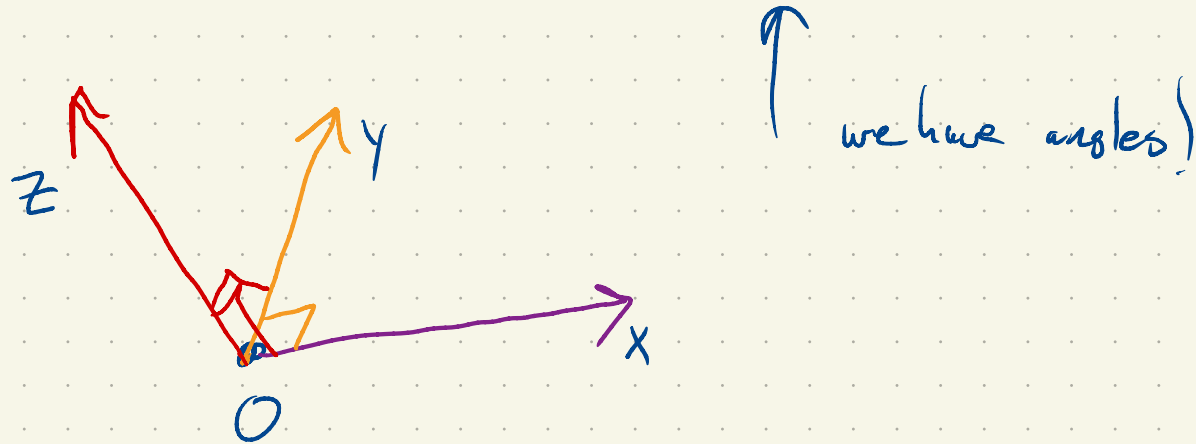Coordinates (3d)

Cartesian coords
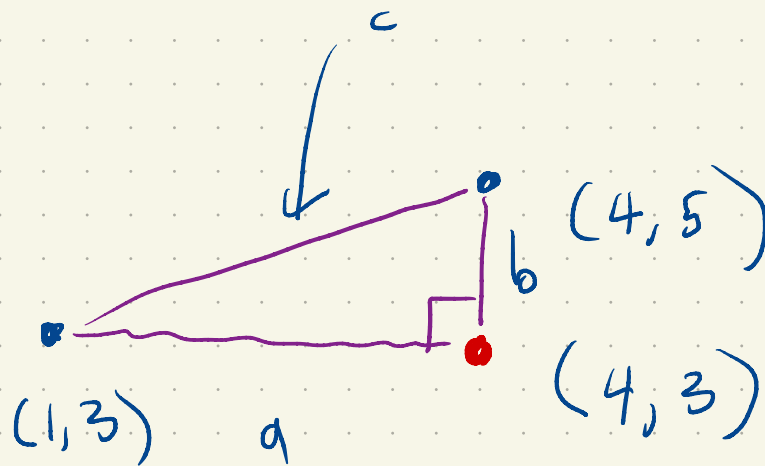
1) pick an origin

2) pick a unit distance (has a notion of length!)

3) pick 3 <u>mutually perpendicular</u> directions
$$\uparrow$$
(we have angles)

4) triple $(1, 2, -3)$

Other coordinate systems: spherical polar coords

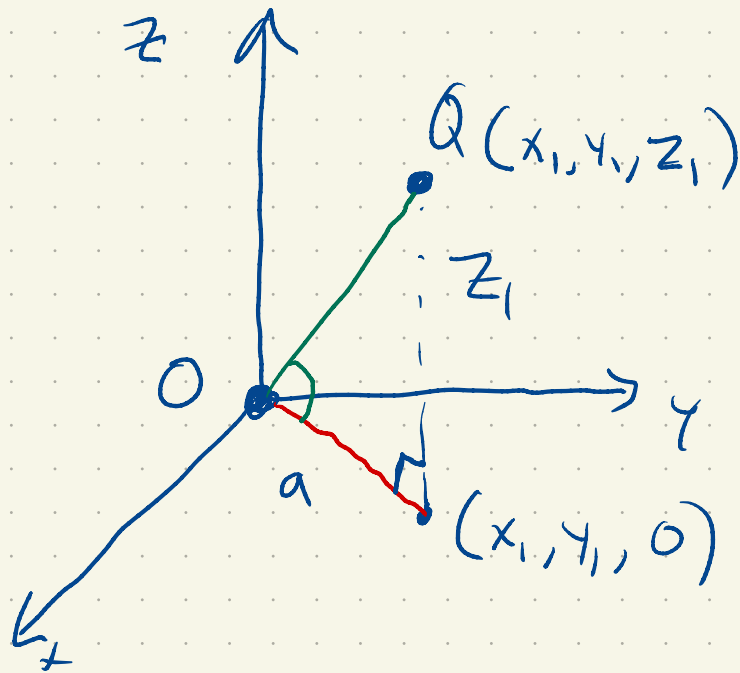cylindrical polar coords

default: Cartesian

$$c$$

$$(4,5)$$

$$b$$

$$(4,3)$$

$$(1,3)$$

$$a$$

$$a^2 + b^2 = c^2$$

$$a = 4 - 1 = 3$$

$$b = 2$$

$$a^2 + b^2 = c^2$$

$$3^2 + 2^2 = c^2$$

$$\Rightarrow \quad c = \sqrt{13}$$

$$13 = c^2$$

z

$Q(x_1, y_1, z_1)$

z_1

O

y

a

$(x_1, y_1, 0)$

x

$Q(x_1, y_1)$

b

$P(x_0, y_0)$ a

$a = x_1 - x_0 = \Delta x$

$b = y_1 - y_0 = \Delta y$

dist from P to Q

is $(\Delta x^2 + \Delta y^2)^{1/2}$

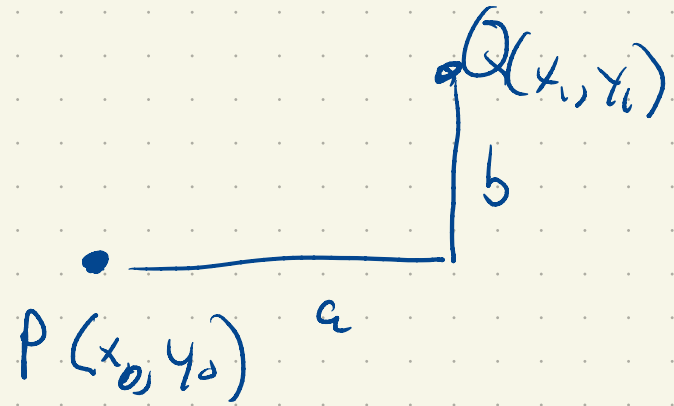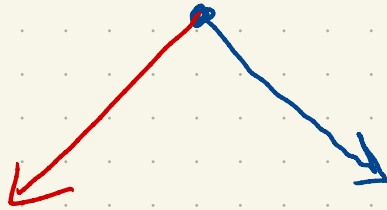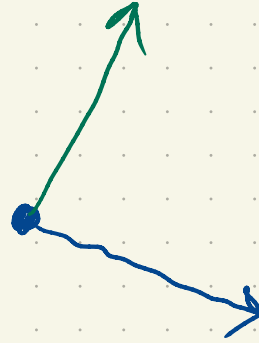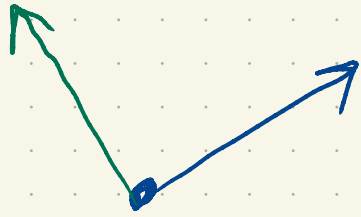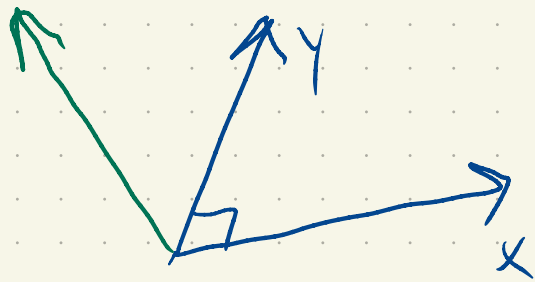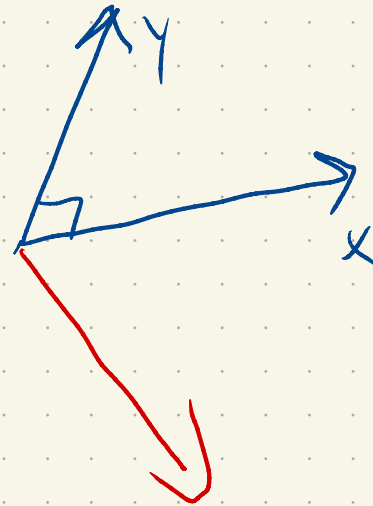$$\sqrt{(x_1 - x_0)^2 + (y_1 - y_0)^2}$$

dist from O to Q?
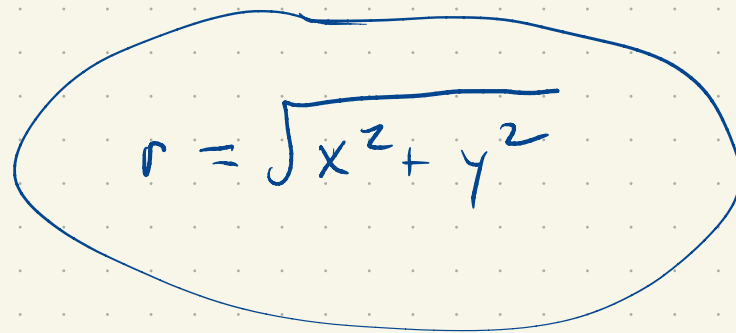
$$\sqrt{x_1^2 + y_1^2 + z_1^2} \quad \checkmark$$

$$\sqrt{a^2 + z_1^2}$$

$a = \sqrt{x_1^2 + y_1^2}$

$a^2 = x_1^2 + y_1^2$

Orientation

Handedness

Right - handed system

sphere

(x,y,z)

$P(x_0, y_0, z_0)$

r

$P(\alpha, \beta)$ (y, y)

$r = \sqrt{x^2 + y^2}$

$x^2 + y^2 = r^2$

$(x-\alpha)^2 + (y-\beta)^2 = r^2$