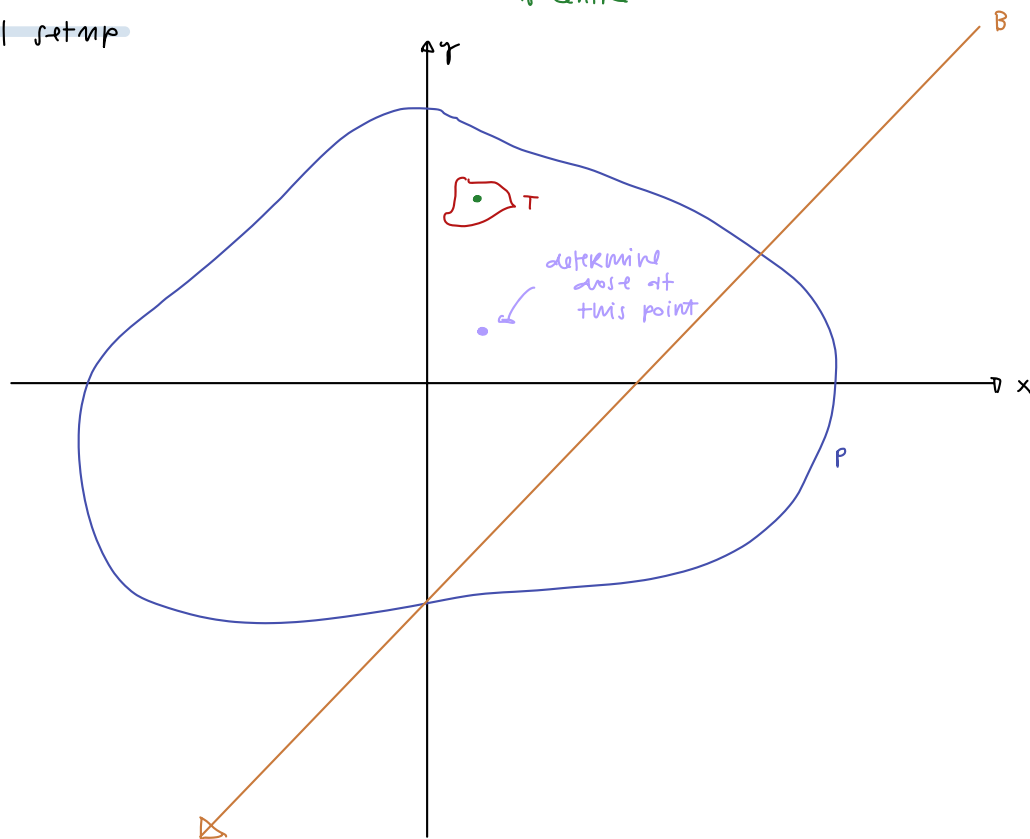Discussion of ex. 4

General setup
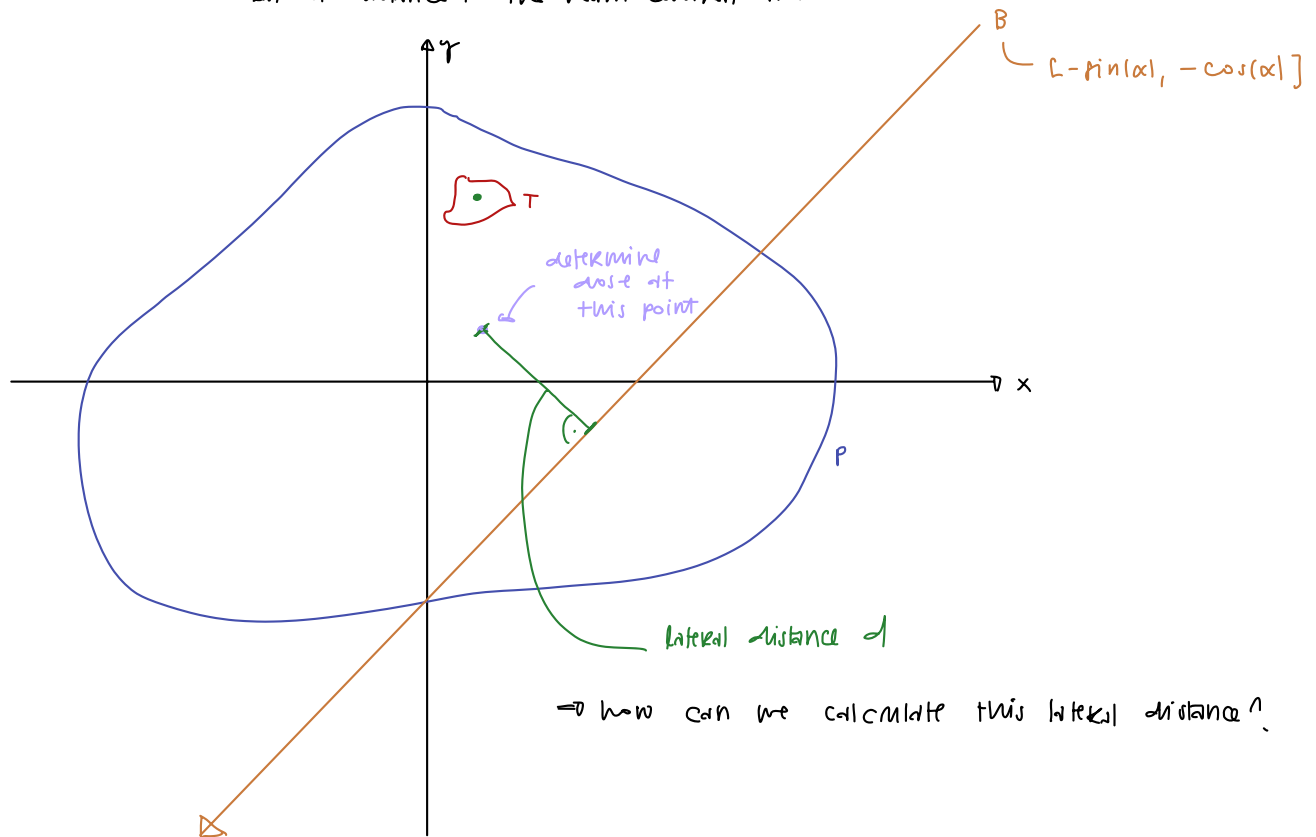
• isocentre

→ what do we need to be able to determine the dose to this specific voxel?
- Radiological depth
- lateral distance to the beam central axis

$[-\sin(\alpha), -\cos(\alpha)]$

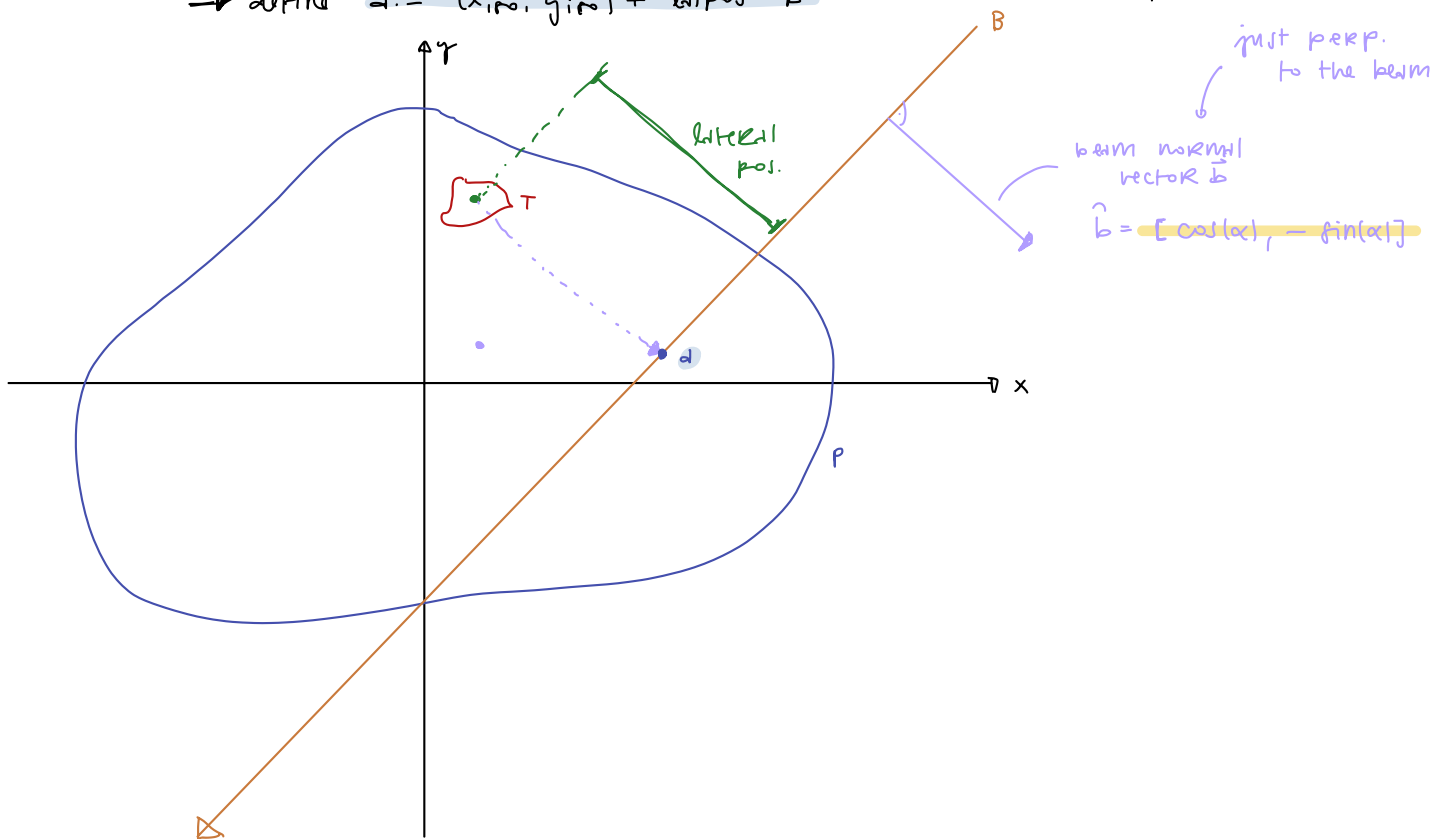determine dose at this point

lateral distance d

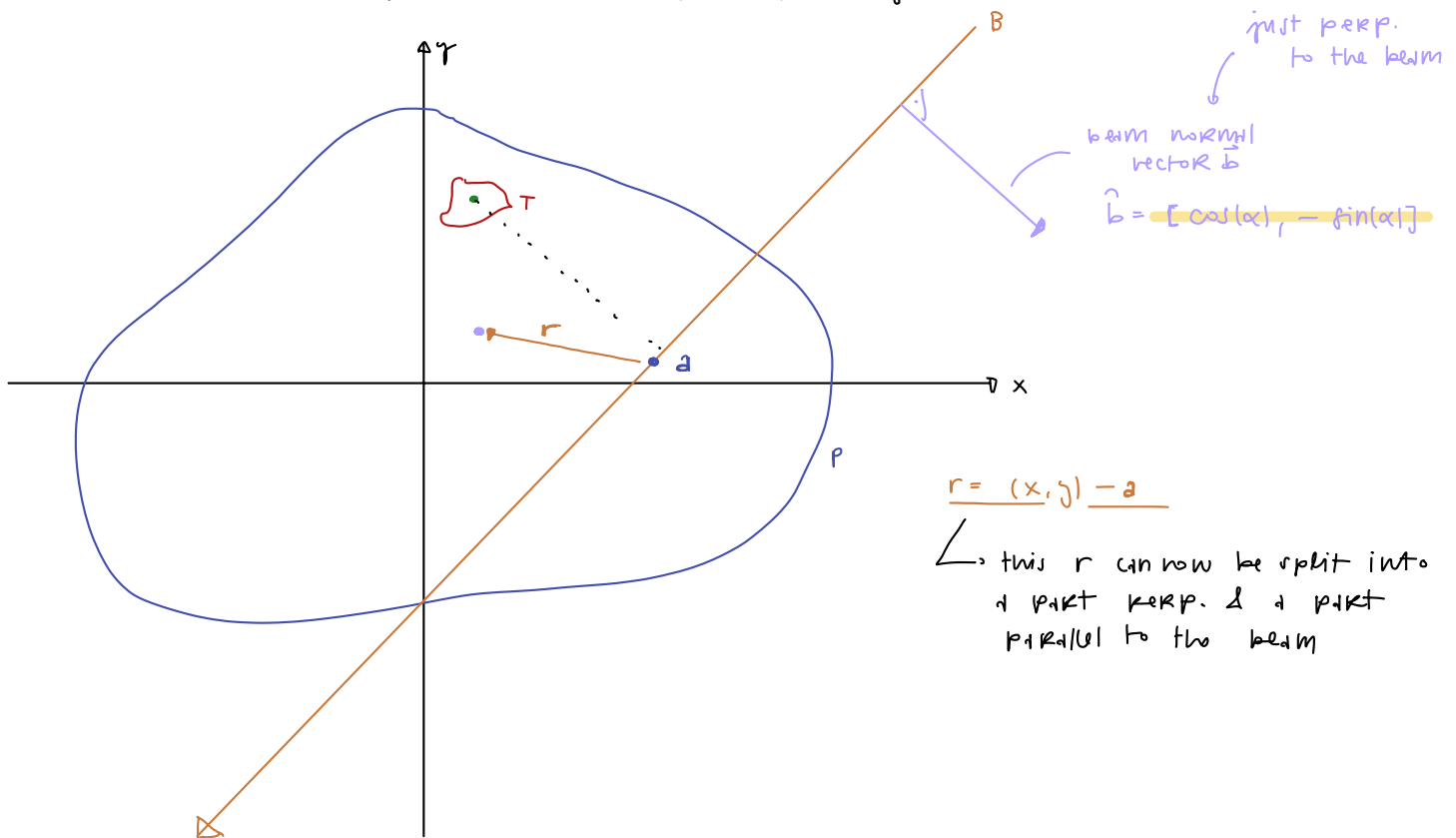→ how can we calculate this lateral distance?

→ what we know:

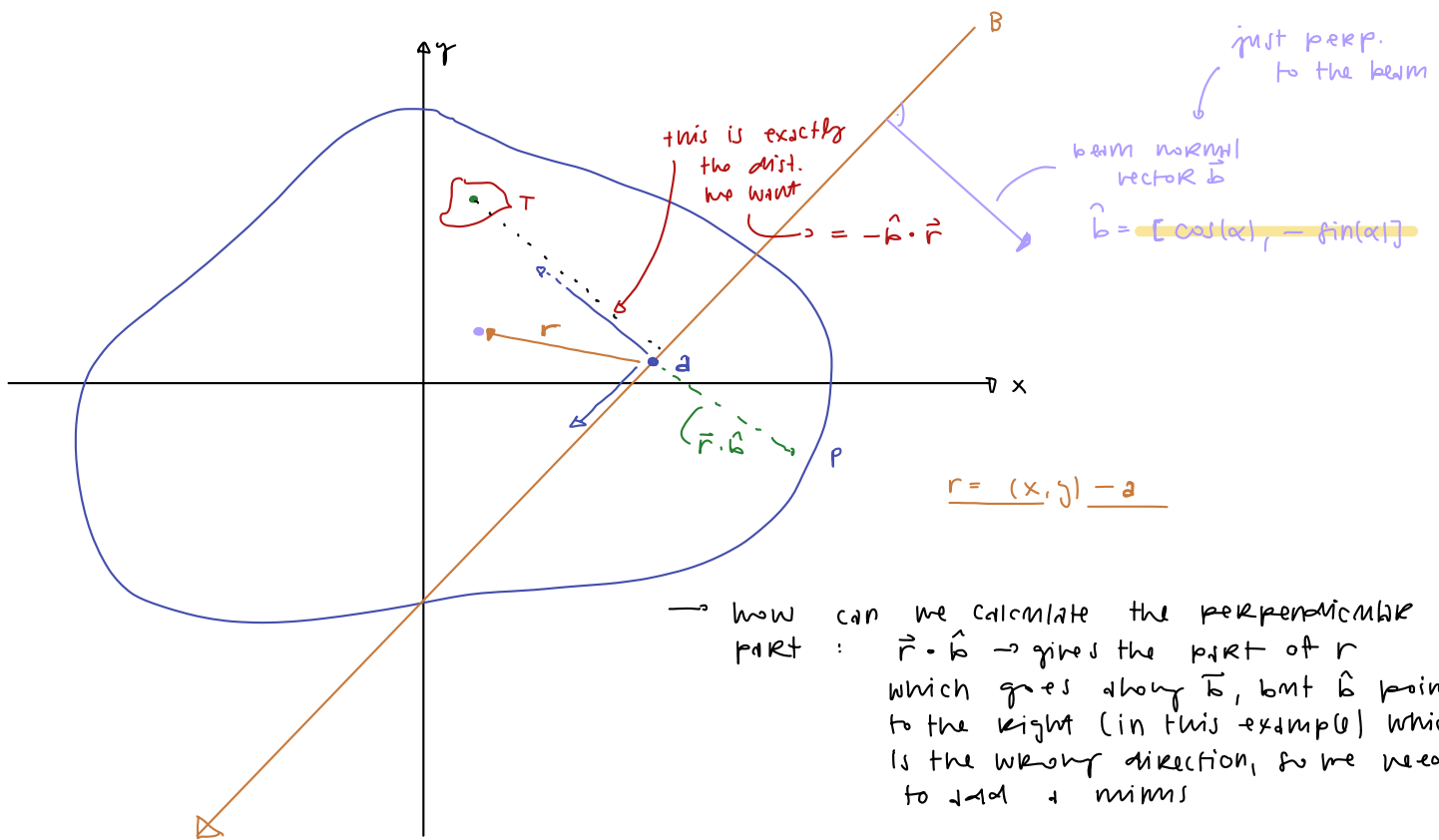lateral position of the beam central axis w.r.t. the iso-centre

beam normal vector: direction of the vector perpendicular to the beam

→ define $a := (x_{iso}, y_{iso}) + latpos \cdot \vec{b}$ ('anchor' point)

just perp. to the beam

beam normal vector $\vec{b}$

$\hat{b} = [\cos(\alpha), -\sin(\alpha)]$

lateral pos.

B

T

d

P

→ determine dist. between a & (x,y)

just perp. to the beam

beam normal vector $\vec{b}$

$\hat{b} = [\cos(\alpha), -\sin(\alpha)]$

B

T

r

d

P

$r = (x,y) - a$

→ this r can now be split into a part perp. & a part parallel to the beam

B

just perp.
to the beam

beam normal
vector $\vec{b}$

this is exactly
the dist.
we want

$\Rightarrow = -\hat{b} \cdot \vec{r}$

$\hat{b} = [\cos(\alpha), -\sin(\alpha)]$

T

r

a

$(\vec{r} \cdot \hat{b})$

P

$r = (x, y) - a$

— how can we calculate the perpendicular
part : $\vec{r} \cdot \hat{b} \rightarrow$ gives the part of r
which goes along $\vec{b}$, but $\hat{b}$ point
to the right (in this example) which
is the wrong direction, so we need
to add a minus

$\longrightarrow \quad d = - \hat{b} \cdot \vec{r}$

— now to determine the dose in this specific voxel you can
just extract the dose of the beamlet at 'x' = d & 'z' = Raddepth