T1 Review:

Class Asked Questions

$\vec{r}(t) = \langle 1, t, t^2 \rangle$

$T = \dfrac{\vec{r}\,'(t)}{|\vec{r}\,'(t)|}$

$\vec{r}\,'(t) = \langle 0, 1, 2t \rangle$

$|\vec{r}\,'(t)| = \sqrt{0^2 + 1^2 + 4t^2} = \sqrt{1+4t^2}$

$T = \langle 0, (1+4t^2)^{-1/2}, 2t(1+4t^2)^{-1/2} \rangle$

$N = \dfrac{dT}{|dT|}$

$dT = \langle 0, \underbrace{-\tfrac{1}{2}(1+4t^2)^{-3/2}\cdot 8t}_{*}, \underbrace{2t\cdot *}_{a} + \underbrace{(1+4t^2)^{-1/2}\cdot 2}_{b} \rangle$

$\sqrt{\tfrac{1}{4}\cdot 64t^2(1+4t^2)^{-3} + 4t^2 \cdot *^2 + 2\,a\cdot b + 1)}$

$B = T \times N$ take cross product $\boxed{\Xi}$

(Class ?: Do example of TNB)

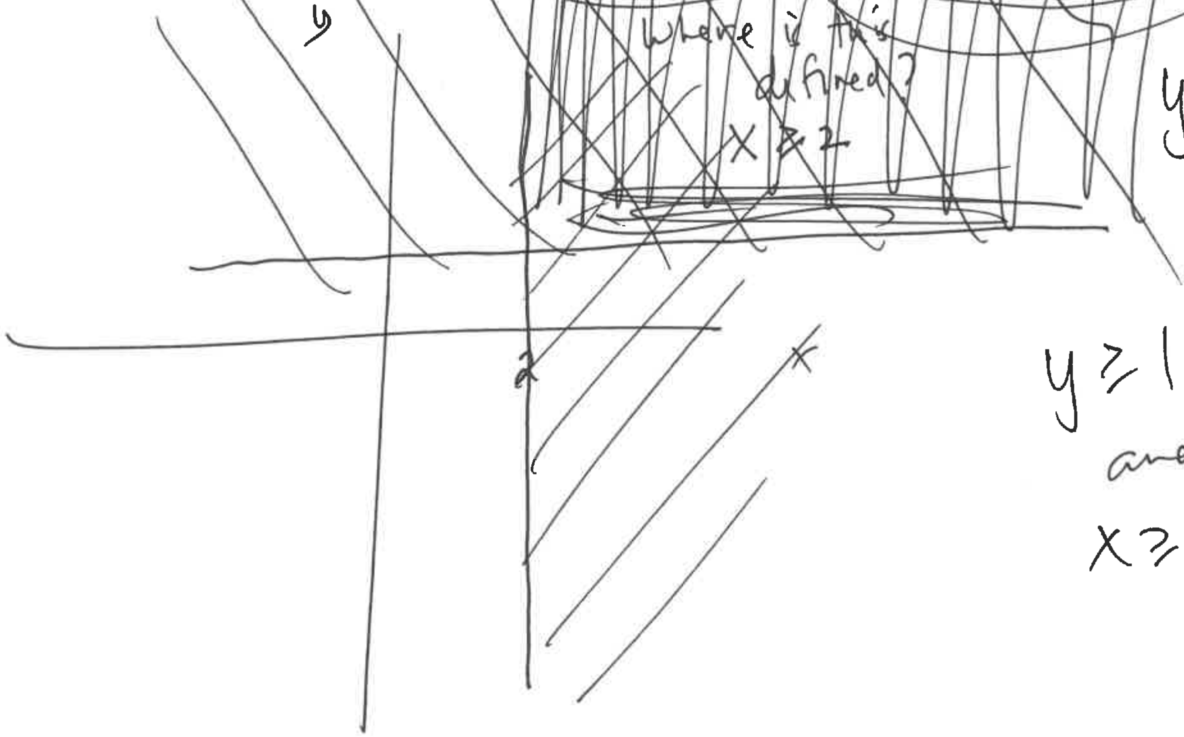
14.1.7 Sketch domain of functn.

$f(x,y) = \sqrt{x-2} + \sqrt{y-1}$

where is this defined?

$x \geq 2$

$y \geq 1$



$y \geq 1$

and

$x \geq 2$

Class ?

14.4.23 linear approx to $f(x,y)$ at (a,b)

$e^x \cos xy$ @ $(0,0)$

$1 + 1\cdot(x-0) + 0\cdot(y-0) = \boxed{x+1}$

$$L(x,y) = f(a,b) + f_x(a,b)\underbrace{(x-a)}_{\Delta x} + f_y(a,b)\underbrace{(y-b)}_{\Delta y}$$

3/4

a Δx x

$x = a + \Delta x$

$\Delta x = x - a$

$e^0 \cos(0\cdot 0)$

$1 \cdot 1$

1

$f_x = e^x \cdot (-y \sin xy) + \cos(xy)\cdot e^x$

$f_y = e^x \cdot (-\sin xy)\, x$

$f_x(0,0) = 1$

$f_y(0,0) = 0$

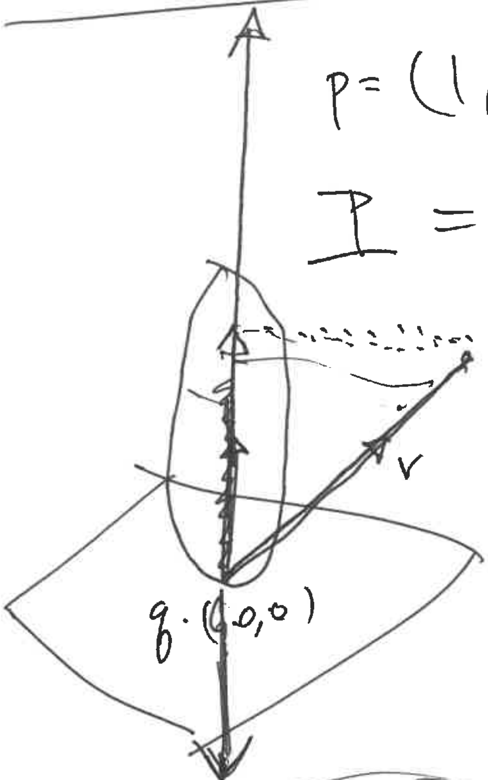
Class?

Do a lin approx

Distance from point$_p$ to a plane. $\mathcal{P}$

$p = (1, \pi, e)$

$\mathcal{P} = x + 2y + 3z = 6.$



Find point on $\mathcal{P}$

e.g. $(6,0,0) = q$

Set 2 vars to zero, Solve for third. ///.

$\vec{v} = \vec{qp} = \langle -5, \pi, e \rangle$

$\vec{n} = \langle 1, 2, 3 \rangle$

$$\left| \text{proj}_{\bar{n}} \bar{v} \right| = \frac{\bar{v} \cdot \bar{n}}{|n|}$$

$$\boxed{\text{proj}_{\bar{n}} \bar{v} = \frac{\bar{v} \cdot \bar{n}}{\bar{n} \cdot \bar{n}} \vec{n}}.$$

$$= \frac{\bar{v} \cdot \vec{n}}{|n|} \cdot \frac{\vec{n}}{|n|}.$$

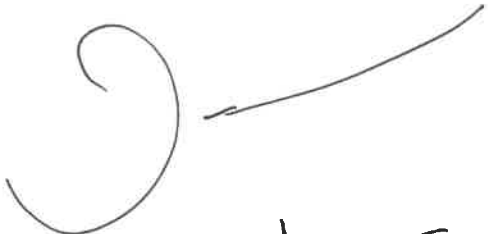
$$\frac{\bar{v} \cdot \bar{n}}{|n|} = \frac{\langle 1, 2, 3 \rangle \cdot \langle -5, \pi, e \rangle}{|n|} = \left| \frac{-5 + 2\pi + 3e}{\sqrt{1 + 4 + 9}} \right|$$

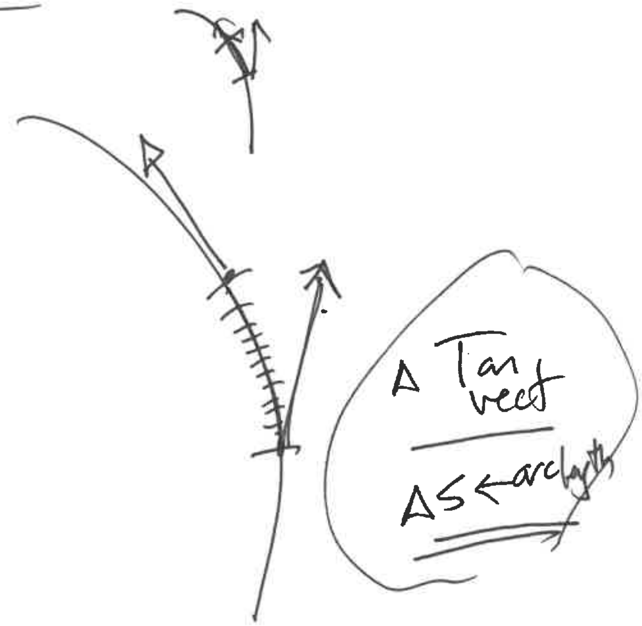
8/10

Class ?: distance of point to a Plane.

κ Curvature

$\vec{r}(t) = \langle t, \cos t, t^2 \rangle$





curvature =

$$\frac{|r' \times r''|}{|r'|^3}$$

$r' = \langle 1, -\sin t, 2t \rangle$

$r'' = \langle 0, -\cos t, 2 \rangle$

$$\begin{vmatrix} i & j & k \\ 1 & -s & 2t \\ 0 & -c & 2 \end{vmatrix} = \begin{matrix} i & -2s + 2t\cos. \\ -j & 2. \\ k & (-c) \end{matrix}$$

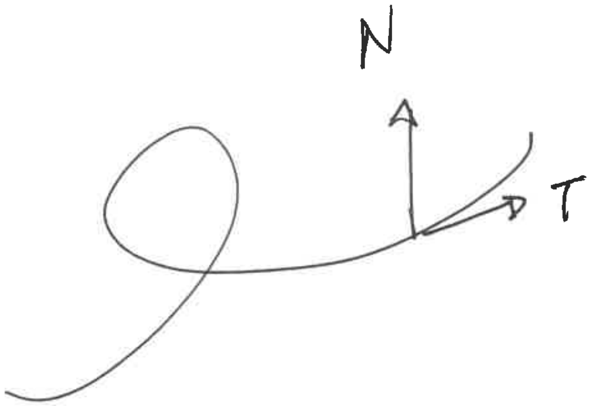
$r' \times r'' = \langle -2\sin t + 2\cos t, -2, -\cos t \rangle$

$|r' \times r''| = \sqrt{4s^2 + 4c^2 - 8\sin\cos. + 4. + c^2 t}$

$|r'| = \sqrt{1 + \sin^2 t + 4t^2}$

$$\frac{\sqrt{8 + \cos^2 t - 8\sin t\cos t}}{\left(\sqrt{1 + \sin^2 t + 4t^2}\right)^3}$$

Class? : Curvature



$$r'' = \underset{\substack{\uparrow \\ \text{Dot.}}}{a_T}\, T + \underset{\substack{\uparrow \\ \text{Cross}}}{a_N}\, N$$

$$a_T = \frac{|r' \cdot r''|}{|r'|}$$

$$a_N = \frac{|r' \times r''|}{|r'|}$$

Class? : a_T and a_N