§13.1 Questions?

Mostly "Can I use a CAS?"

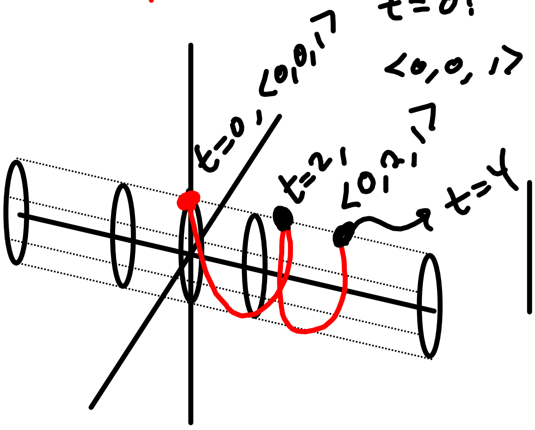
§13.1 #10 makes it nice!

$\bar{r}(t) = \langle \sin(\pi t), t, \cos(\pi t) \rangle$

xy-plane projection

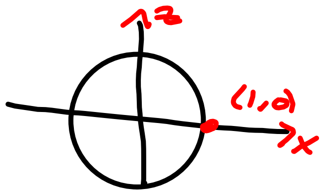
Meh.

$t=0$: $\langle 0,0,1 \rangle$



xz-plane projection

$\langle \sin(\pi t), \cos(\pi t) \rangle$



Period of $\langle \sin(\pi t), \cos(\pi t) \rangle$

$\pi t = 2\pi$

$t = \frac{2\pi}{\pi} = 2 = T =$ period.

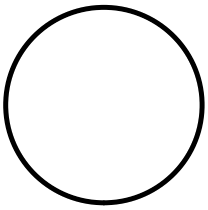
§13.1 Please add #s 28, 30, 36

#28 $\vec{r} = \langle \sin t, \cos t, \sin^2 t \rangle$

xy-projection:
circle of radius 1,
centered at $(x,y) = (0,0)$

$x^2 + y^2 = \sin^2 t + \cos^2 t = 1$

$\boxed{x^2 + y^2 = 1} \to$ implicit plots.

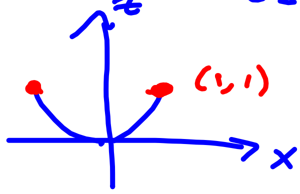


xz-plane

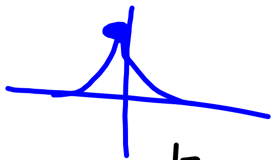
$x = \sin t, \ z = \sin^2 t$

$z = x^2$ $\quad -1 \le x \le 1$

$0 \le z \le 1$



concave up?



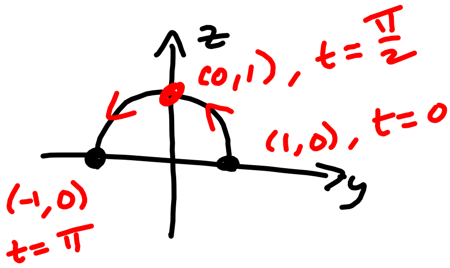
yz-plane

$z = \sin^2 t$

$y = \cos t$

$z + y^2 = 1$

$z = 1 - y^2$

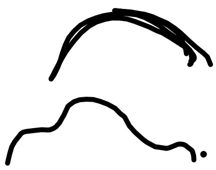


$$\frac{dz}{dy} = \frac{\frac{dz}{dt}}{\frac{dy}{dt}} = \frac{2\sin t \cos t}{-\sin t}$$

$$= -2\cos t$$

$$\frac{d^2 z}{dy^2} = \frac{\frac{d}{dt}\left(\frac{dz}{dy}\right)}{\frac{dy}{dt}}$$

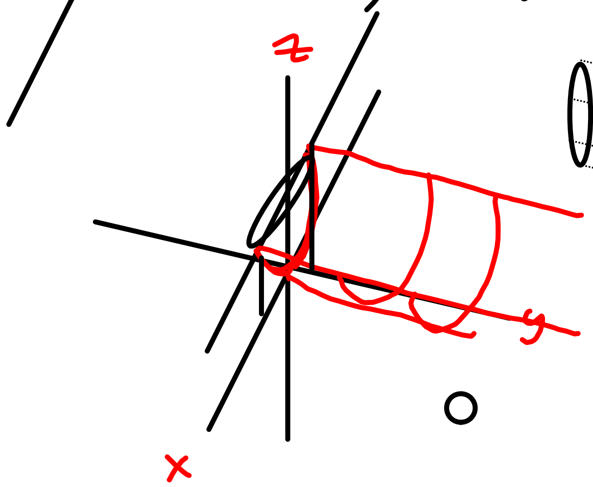
$$= \frac{2\sin t}{-\sin t} = -2$$ C.D. everywhere

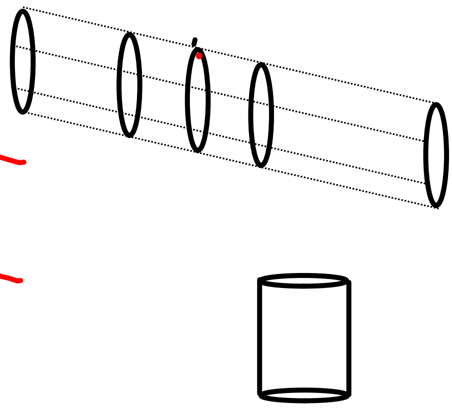


~~This~~ is enough to get 'er done.'

We W.T.S. that $\bar{r}$ lives on the cylinders

$$z = x^2, \quad x^2 + y^2 = 1$$





§13.2

'Most everything works as hoped & expect.

$\bar{r} = \langle f, g, h \rangle$

$\bar{r}' = \langle f', g', h' \rangle$

Unit Tangent Vector = $\bar{T} = \dfrac{\bar{r}'}{|\bar{r}|} = \dfrac{1}{|\bar{r}|}\bar{r}'$

See Example 1.

$a, b, c \in \mathbb{R}$ $\quad (\in C^1)$

f, g, h funcs.

$\bar{u}, \bar{v}, \bar{r}$, vector funcs.

C^0 = cnts funcs,

C^1 = difbl funcs

C^∞ = infinitely difbl funcs.

T3

① $(\bar{u} - \bar{v})' = \bar{u}' - \bar{v}'$

② $(c\bar{v})' = c\bar{v}'$

③ $(f\bar{u})' = f'\bar{u} + f\bar{u}'$

④ $(\bar{u} \cdot \bar{v})'$

$= \bar{u}' \cdot \bar{v} + \bar{u} \cdot \bar{v}'$

$(fg)' = f'g + fg'$

⑤ $(\bar{u} \times \bar{v})' = \bar{u}' \times \bar{v} + \bar{u} \times \bar{v}'$

⑥ $(\bar{u}(f(t)))' = (\bar{u}'(f(t)))f'(t)$

$\frac{d}{dt} < \sin(\cos t), \cos t, \cos(\cos t) >$

$\bar{u} = < \sin t, t, \cos t >$

$u(\cos(t)) =$

$\frac{d}{dt}\left[\bar{u}(\cos t)\right] = -\sin t < \cos(\cos(t)), 1, -\sin(\cos t)>$

§13.2 #s 1, 2, 3, 5, 9, 15, 17, 21, 23