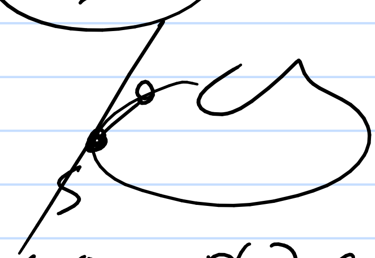
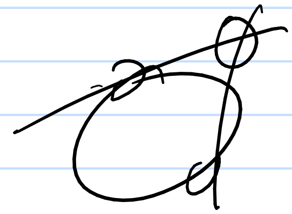
Math 344

Q's

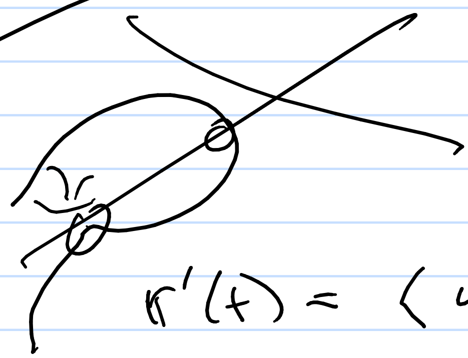
$r(t) = \langle 4\sin(\pi t), 3\sin(\pi t), 2\cos(\pi t) \rangle$

@ $t=0$ and $t=0.5$





find points of intersection



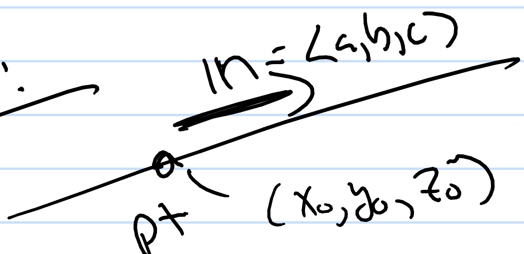
$t=0$ $\quad r(0)$ gives point $(0,0,2)$

$r'(0)$ gives tangent direction

$r'(t) = \langle 4\pi\cos(\pi t), 3\pi\cos(\pi t), -2\pi\sin(\pi t) \rangle$

$r'(0) = \langle 4\pi, 3\pi, 0 \rangle$

Know:



eqn for a line?

review ch 12

$r(t) = \langle x_1(t), x_2(t), \ldots \rangle$

So far..

$\vec{r}(t) = \langle x_1(t), x_2(t), \ldots, x_n(t) \rangle$

we can: $\lim$, $\frac{d}{dt}$, $\int dt$, $\int_a^b dt$

shows: do lots of $\lim x_1(t)$

$\int x_1(t)\,dt$ etc ~

General formulas of deriv.

(similar to calc 1,2)

$$\frac{d}{dx}\{f \pm g\} = f' \pm g'$$

$$\frac{d}{dx}\{f \cdot g\} = f'g + fg'$$

$$\frac{d}{dt}[u \pm v] = u' \pm v'$$

$$\int \cos x\,dx = \sin x + C$$

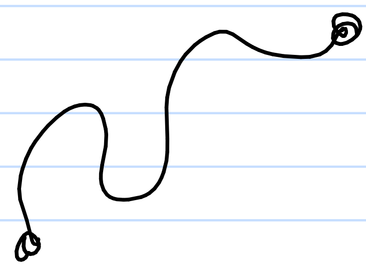
$$\frac{d}{dt}[c v] = c v'$$

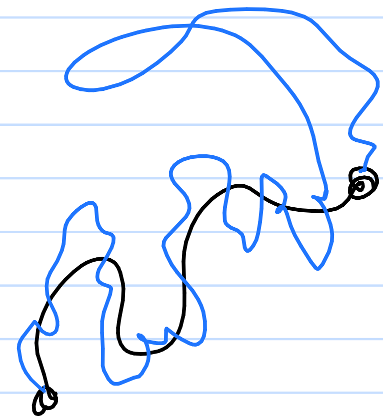
$$\frac{d}{dt}[f(t)\, v] = f'(t)\, v + f(t)\, v'$$

$$\frac{d}{dt}[v \cdot u] = v' \cdot u + v \cdot u'$$

$$\frac{d}{dx}[v \times u] = \int v' \times u + v \times u' \,dt$$

13.3 / 13.4 Applications



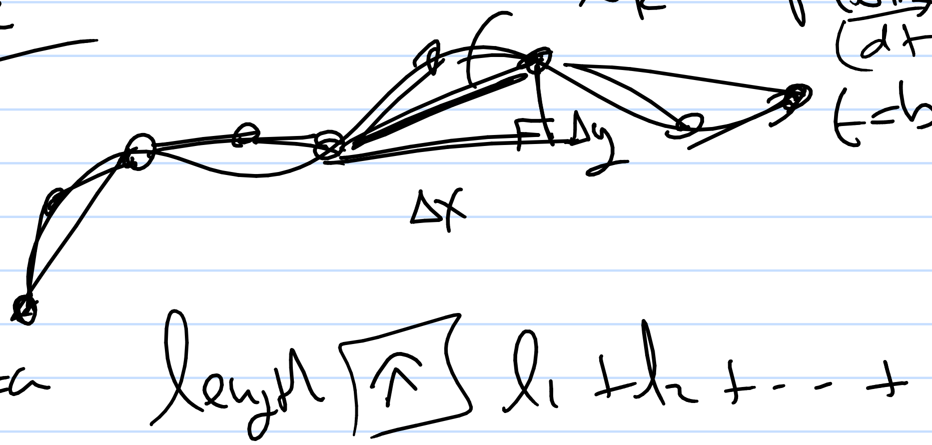


Application #1

length of space curve

2D

$$l_k = \sqrt{\left(\frac{\Delta x}{dt}\right)^2 + \left(\frac{\Delta y}{dt}\right)^2}\, dt$$



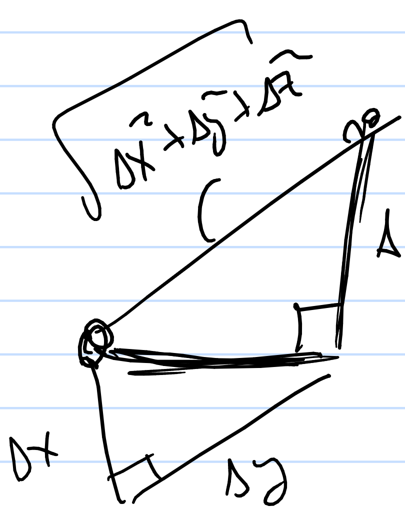
$$\text{length} \approx l_1 + l_2 + \dots + l_{last}$$

let $\Delta x \to 0$ sum $\to$ length

2D

$$\text{length} = \int_a^b \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2}\, dt = \int_a^b \left|\sqrt{(x')^2 + (y')^2}\right| dt$$

3D



$$\text{length} = \int_a^b \sqrt{(x')^2 + (y')^2 + (z')^2}\, dt$$

$\mathbf{r} = \langle x, y, z \rangle \qquad \mathbf{r}' = \langle x', y', z' \rangle$ 3D

Know:

$\mathbf{r} = \langle x, y \rangle \qquad \mathbf{r}' = \langle x', y' \rangle$ 2D

$$|\mathbf{v}| = \sqrt{a^2 + b^2 + c^2}$$

$\langle a, b, c \rangle$

So

$$\text{length} = \int_a^b |\mathbf{r}'| \, dt$$

Applicatn 2

length = s

$$s(t) = \int_a^t |r'(u)|\, du$$

↓

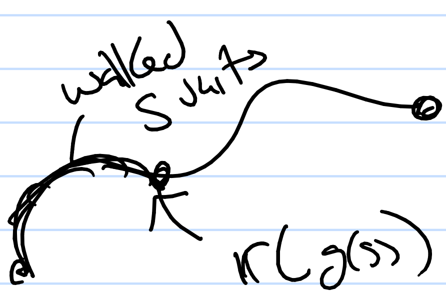
$s(t)$ is a functn

looks like $s = f(t)$

Solve for $t = \underline{g}(s)$

Applicatn:

so $r(t) = r(g(s))$ functn of s



$r(g(s))$ position after s units walked