Motionplanning 7.

1. a) $f(x) = x$

$f'(x) = 1$

$f''(x) = 0$

$\vdots$

- All derivatives exist
- Continuous

$\hookrightarrow C^\infty$

b) C^0: position: $f(x)$

C^1: velocity: $f'(x)$

C^2: acceleration: $f''(x)$

C^3: Jerk $f'''(x)$

C^4: Snap $f''''(x)$: not continuous or does not exist

$C^3 \to C^2$ exist $\to$ acceleration is differentiable

C^4 does not exist

C^3 is jerk $\to$ not differentiable or the derivative is not continuous

2. B-Splines are controlled by controlpoints
   ↳ set joint limits at Control Points
   ↳ $\Theta_{min} \leq P_i \leq \Theta_{max}$

   Problem: no guarantee for keeping limits

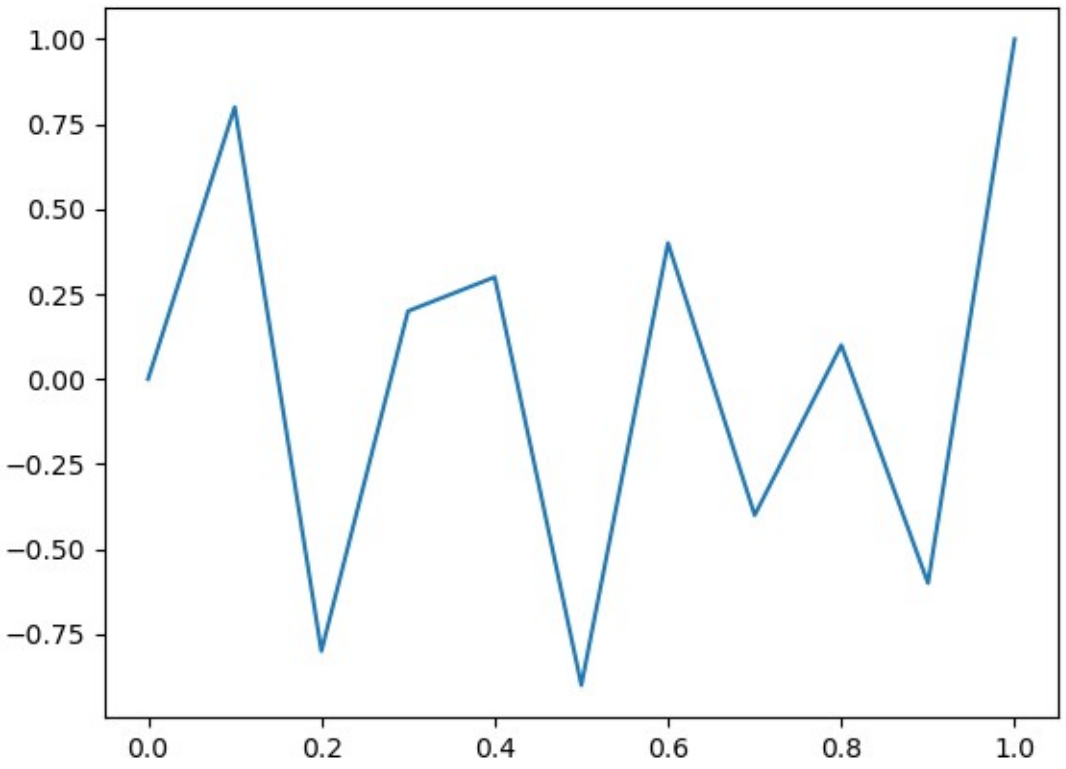
- Smoother than B-spline to keep limits inward
- to fast between two points → slow the time down

3b) $U = \|p_i - p_{i-1}\|_2 + \|p_i - p_{i+1}\|_2$

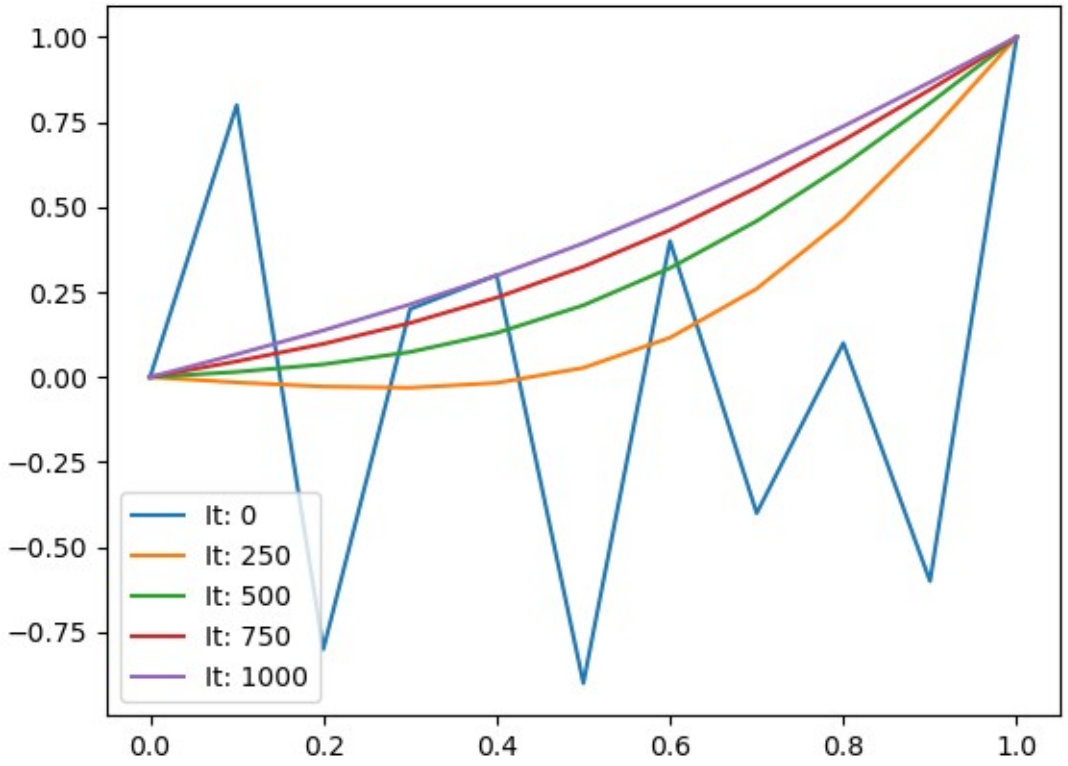
$\nabla U = 2(p_i - p_{i-1}) + 2(p_i - p_{i+1})$

$= \underline{2(2p_i - p_{i-1} - p_{i+1})}$

3a)


1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
0.0
0.2
0.4
0.6
0.8
1.0

3c)


1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
0.0
0.2
0.4
0.6
0.8
1.0
It: 0
It: 250
It: 500
It: 750
It: 1000