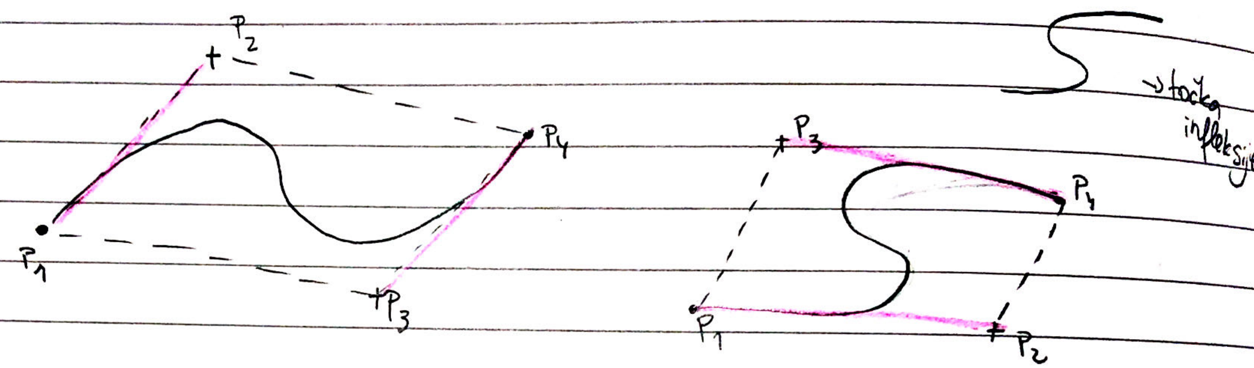
BEZIER KRIVULJA

• **KRIVULJE**

- glavna krivulja današnje vektorske grafike
- na temelju postavljanja 4 točke unaprijed možemo vidjeti rasprostiranje krivulje
- definira se s 4 točke

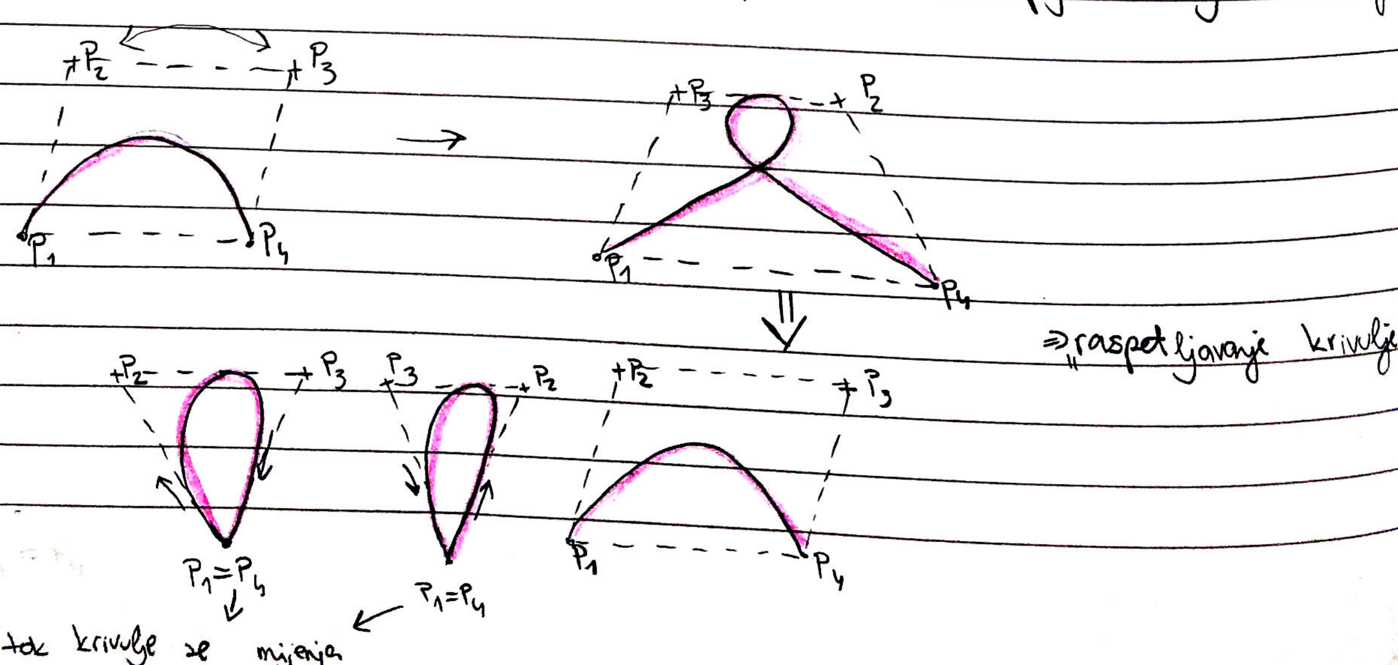
$\overline{P_1 P_2}$

$\overline{P_3 P_4}$



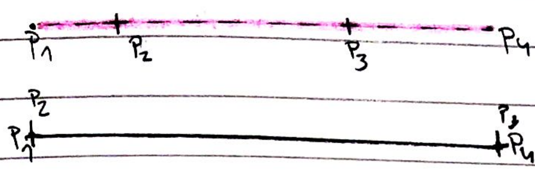
- povežemo li sve 4 točke, dobijemo **poligon** - on označava zatvoreni prostor unutar kojeg moramo nacrtati krivulju
- zakonitost krivulje - $\overline{P_1P_2}$ čini tangentu na točku P_1 krivulje, a $\overline{P_3P_4}$ čini tangentu na točku P_4
  - ne smije krivulja izlaziti izvan konveksnog poligona
  - tangenta P_1P_2 govori kako krivulja mora ući u točku P_1, tj. kako krivulja mora ući u točku P_4

- na temelju položaja 4 točaka možemo predviđati i unaprijed dizajnirati krivulje



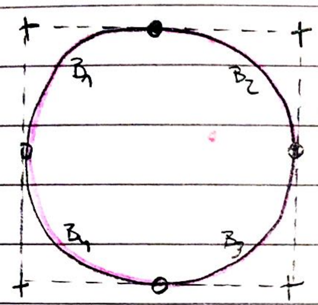
- DUŽINE

- pomoću Bezierovih krivulja moguće je dizajnirati i dužine

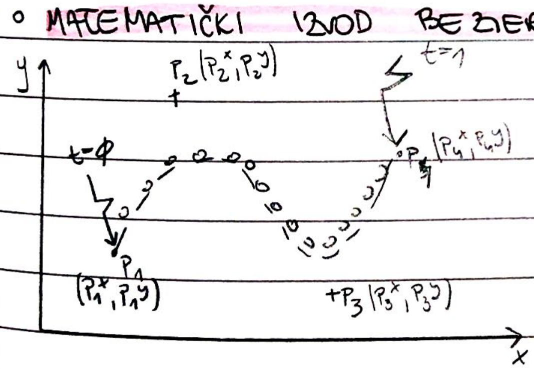


- točke P_2 i P_3 moraju biti bilo gdje na pravcu
- dobijemo dužinu
- početak i 1. tangenta te kraj i 2. tangenta na istim na koordinatama

- KRUŽNICA



- MATEMATIČKI IZVOD BEZIER KRIVULJE



$$x(t) = (-t^3 + 3t^2 - 3t + 1) \cdot P_1^x + (3t^3 - 6t^2 + 3t) \cdot P_2^x + (-3t^3 + 3t^2) \cdot P_3^x + t^3 \cdot P_4^x$$

$$y(t) = (-t^3 + 3t^2 - 3t + 1) \cdot P_1^y + (3t^3 - 6t^2 + 3t) \cdot P_2^y + (-3t^3 + 3t^2) \cdot P_3^y + t^3 \cdot P_4^y$$

- parametarska krivulja 3. stupnja
  - ↳ piše se u 1 dim., kasnije se razvija u više

$$C(t) = \underset{1\times4}{[t^3\ t^2\ t\ 1]} \times B \times \underset{4\times1}{\begin{bmatrix} P_1 \\ P_2 \\ P_3 \\ P_4 \end{bmatrix}}$$

$$\left.\begin{array}{l} t=\phi \quad x(0) = P_1^x \\ y(0) = P_1^y \end{array}\right\} P_1 \qquad \left.\begin{array}{l} t=1 \quad x(1) = P_4^x \\ y(1) = P_4^y \end{array}\right\} P_4$$

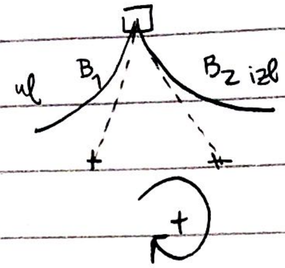
$t \in [0,1]$

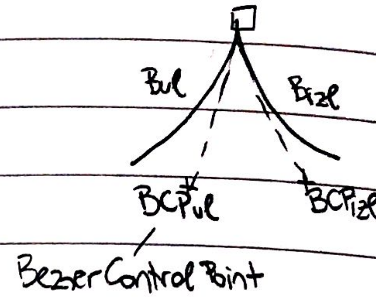
$$B = \begin{array}{cc} \begin{bmatrix} -1 & 3 & -3 & 1 \\ 3 & -6 & 3 & 0 \\ -3 & 3 & 0 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix} & \begin{array}{l} \Sigma=0 \\ \Sigma=0 \\ \Sigma=0 \\ \Sigma=1 \end{array} \\ \begin{array}{cccc} \Sigma=0 & \Sigma=0 & \Sigma=0 & \Sigma=1 \end{array} & \end{array}$$

- suma svih stupaca i redaka je 0, osim zadnjih koji su 1

- **SPOJNE BEZIER TOČKE**
  - 3 vrste spojnih Bezier točaka:

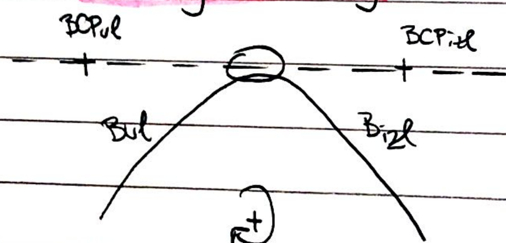
1. KUTNI SPOJ □





$$\boxed{BCP_{izl} \neq BCP_{ul}}$$

2. KRIVULJNI SPOJ ○



$\boxed{BCP_{izl} = \text{f. pravca}}$ (BCPul, spojna točka)

3. TANGENTNI SPOJ △

- skiciramo tangente