

**Bonus Video!**

# **Bézier Concepts Review**

# Properties of Bézier Curves

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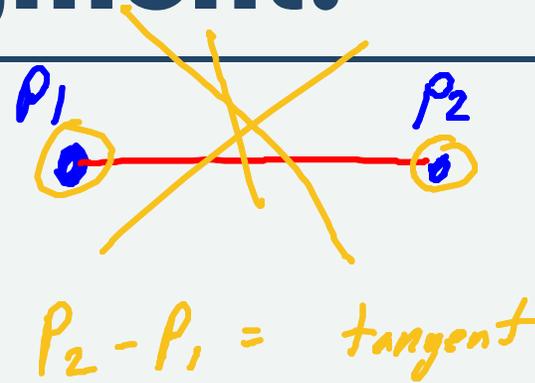
1. Interpolate Endpoints
2. Tangents from last pairs
3. Tangents scaled by degree
4. Stay in convex hull
5. Variation diminishing
6. Affine invariant

# $n=2$ ( $d=1$ ) - it's a line segment!

Two points ( $n=2$ ), degree =  $n-1$

1. Interpolate Endpoints
2. Tangents from last pairs
3. Tangents scaled by degree
4. Stay in convex hull
5. Variation diminishing
6. Affine invariant

1 crossing

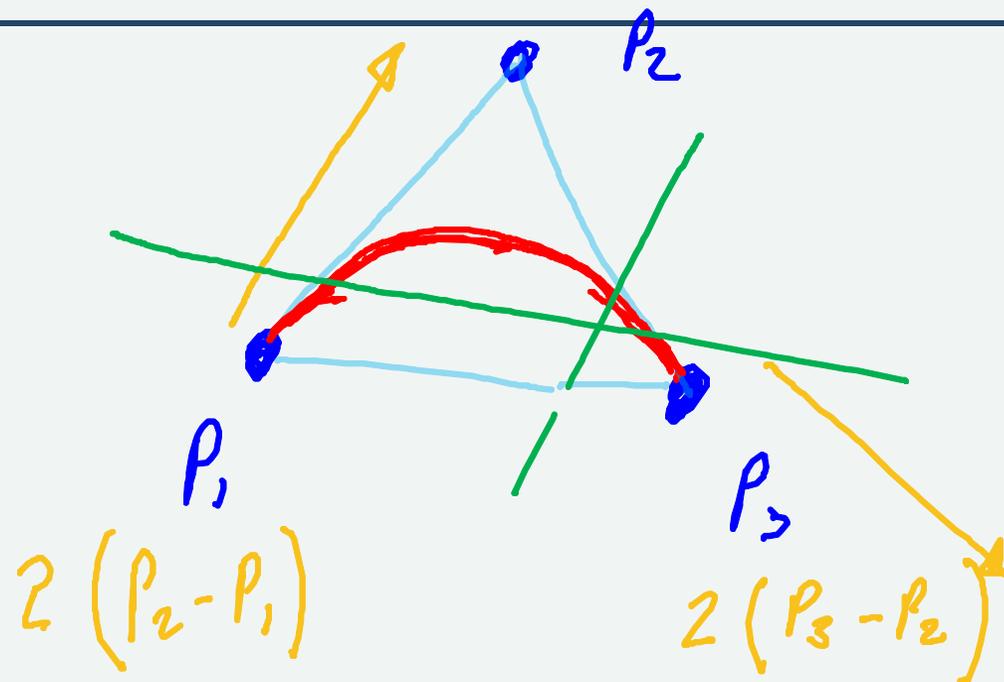


# n=3 (d=2) - Quadratic Bézier

Three points ( $n=3$ ), degree =  $n-1$

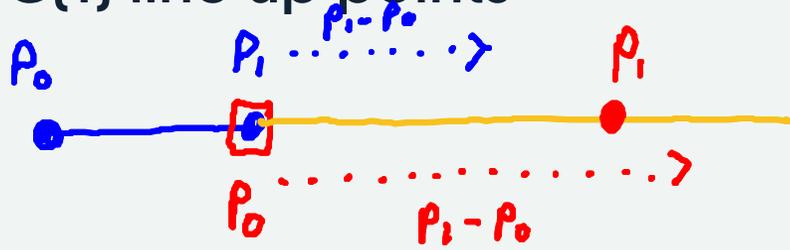
1. Interpolate Endpoints
2. Tangents from last pairs
3. Tangents scaled by degree
4. Stay in convex hull
5. Variation diminishing
6. Affine invariant (trust me)

max  
cost = 2



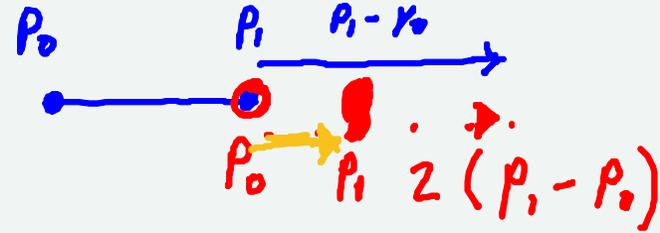
# Connect them!

G(1) line up points



$P_2$

C(1) line up points **and** distance

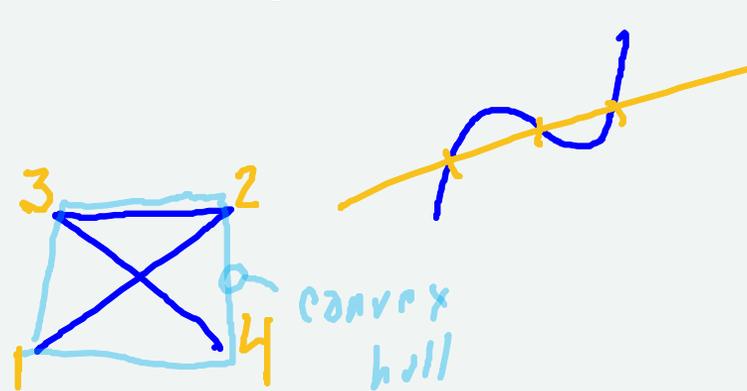
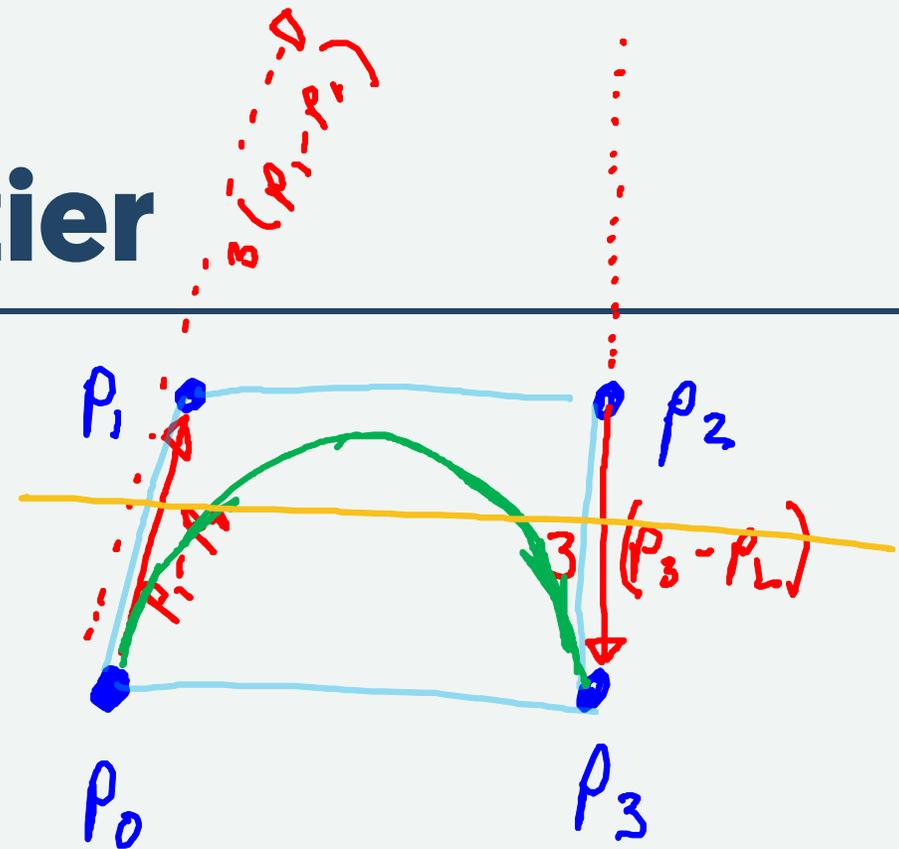


$P_2$

# ~~n=3~~<sup>4</sup> (~~d=2~~<sup>3</sup>) - Cubic Bézier

Three points (~~n=3~~<sup>4</sup>), degree = ~~n-1~~<sup>3</sup>  
*Four*

1. Interpolate Endpoints
2. Tangents from last pairs
3. Tangents scaled by degree
4. Stay in convex hull
5. Variation diminishing *at most 3*
6. Affine invariant (trust me)

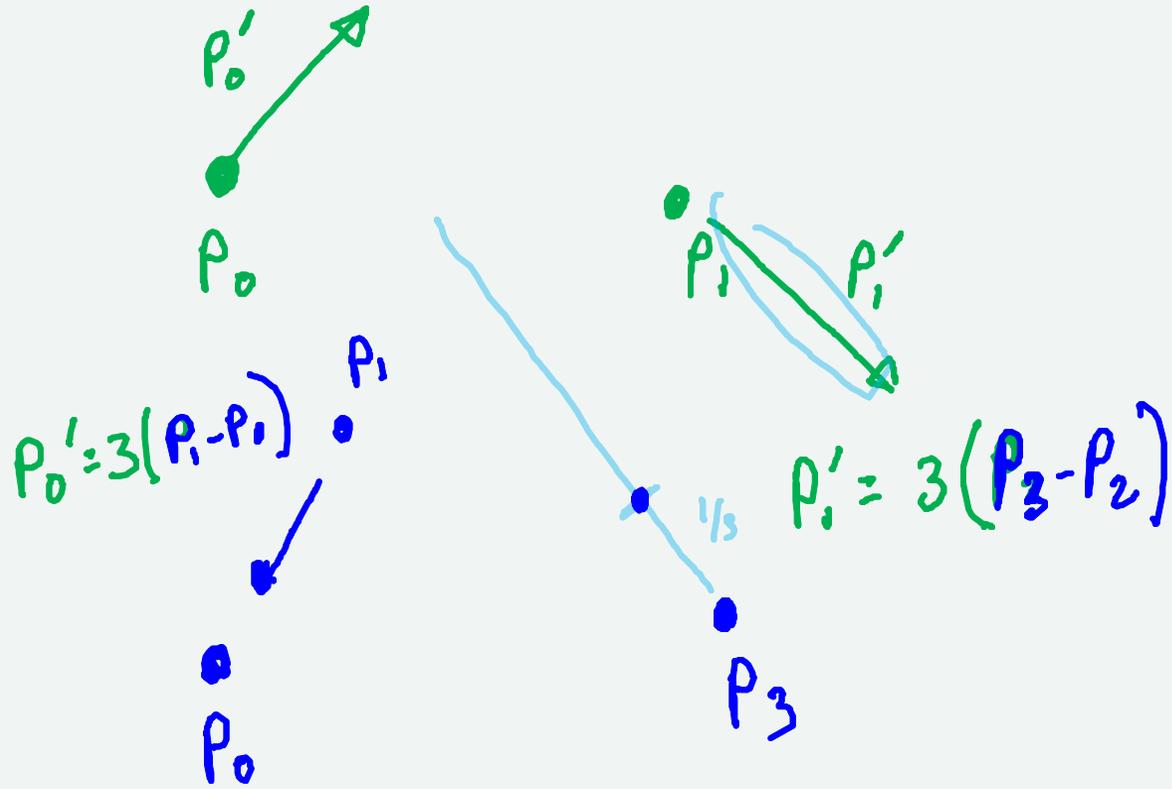


# Convert them!

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## Hermite Form

we know the ends and tangents

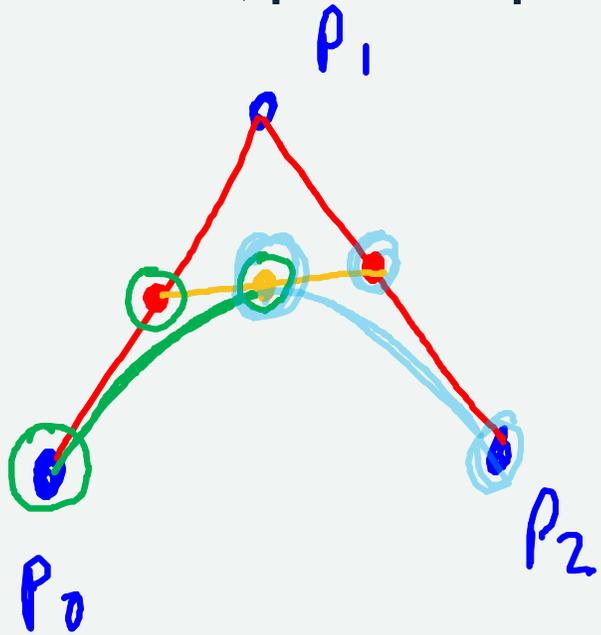


## Other Forms

determine the ends and tangents

# Split Them

Do DeCasteljau, pick the points



$$V = .5$$

