# Exercise Computer graphics – (till November 10, 2006)

## Splines

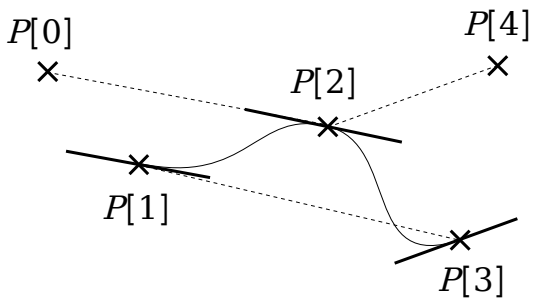
**Exercise 15:** Catmull-Rom Splines

The Catmull-Rom spline is defined such that they interpolate all knots k_i except for the first and last. Their tangent vector within knot k_i is parallel to the line between k_(i-1) and k_(i+1).

a) Express all constraints as a set of simultaneous equations (using polynomials of 3rd degree).

b) Solve the equations for the coefficients.

c) Alter the sample application from the lecture in order to implement Catmull-Rom splines.



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## Bezier curves

**Exercise 16:** Weights for the Bezier Blending function

In the lecture we have expressed the Bezier curve analytically. We started with the degenerated instance of the curve consisting of two points only and extended it to a bent curve using three points.

Both, the straight and the bent curve consisted of weights for each knot.

a) Extend the approach from three to four knots and calculate the weights for each of the four knots.

b) When going from 2, to 3 and finally to 4 knots, can you find a pattern or schema for the weights? Express the weight for knot n in a curve consisting of N knots.

Hint: The factor for each weight is the binomial coefficient.