CAD practical – programming part 3:
Bezier Curves

Generate a CodeBlocks project with "`gnurbsTP3`" files by using CMake. Select "**curve-static**" as build target before compiling and running. You will see two sets of points placed to form two identical semicircles.

1. The one of the top will be used to draw your first Bezier curve and the one of the bottom to test your degree elevation function. The main code is not supposed to be modified for this part of the exercise, as you only need to implement functions in "`api/nbeziercurve.cc`".
   - `void nbeziercurve::P(double u_, npoint& ret) const`
     Implement this function with the De Casteljau's algorithm in order to draw Bezier curves (Theory: ppt 3 pp.37-40). Tip: use a temporary vector of points for the iterations. Compile and run to see the two sets of points with their Bezier curves.
   - `void nbeziercurve::degree_elevation()`
     This function increases the degree of the curve of one. Implement this function with the Forrest's equations (Theory: ppt 3 pp.29-36). Tip: temporary save the new control points in a vector.

2. The next function to implement, called `nbeziercurve::cut`, will split a Bezier curve into two using the cutting algorithm (Theory: ppt 3 pp.41-46).
   - `void nbeziercurve::cut(double u_, npoint& ret, nbeziercurve &left, nbeziercurve &right) const`
     This function requires :
     i. `double u_` : value of the curve parameter u where the cut must be done.
     ii. `npoint& ret` : reference to a npoint that will be the cutting point.
     iii. `nbeziercurve &left` : reference to a nbeziercurve that will be the curve of the left after the cut.
     iv. `nbeziercurve &right` : reference to a nbeziercurve that will be the curve of the right after the cut.

     Tip: As explained in the theory, it is easy to build the two curves through the De Casteljau's algorithm.
   - Modify `main.cc` to test your cutting algorithm.
     i. Generate another identical semicircle (same Bezier curve) but centred on point (3, 0, 0, 1). Call it '`curve_cut`' as you will use it to test your cut function.
     ii. Call the cut function on this Bezier curve (instantiate previously two object nbeziercurve that you will call '`curve_left`' and '`curve_right`') and draw them. Set the cut value to 0.5. Tip: look at how the other curves are drawn.
     iii. Try to move the middle point of the circle (Ctrl+K to be able to move points in the graphic window). Try with another value of u.