COMP 770 Homework 4 Apr 20, 2009 **Due:** May 01, 2009

1. In the class, we had discussed a degree elevation algorithm for polynomial curves. How will you extend it to rational curves? Show all the derivation.

2. Consider the problem of approximating a high degree Bézier curve by a collection of quadratic (degree two) Bézier curves. You are given a curve of degree n (with n+1 control points Pi) and a tolerance $\epsilon$. Present an algorithm to compute a collection of quadratic Bézier curves that approximate the original curve within the given tolerance $\epsilon$. Moreover, the maximum distance between any point on the original curve and the new curves is at most $\epsilon$. What is the level of continuity (geometric or parametric) for the set of quadratic curves that your algorithm has computed?

3. Derive the B-spline Blending functions for a cubic curve with a uniform knot sequence. Draw the geometric shapes of these blending functions?

4. Find the Bézier control points of a closed spline of degree 4 whose control polygon consists of the edges of a square, and whose knot sequence is uniform and consists of simple knots.