DigiPen Institute of Technology, Bilbao

MAT300 Curves & Surfaces

Spring 2018. **Homework 5**: **Deadline: 15-4-2020**

Consider the parametrized polynomial curve $\gamma : [0, 1] \to \mathbb{R}^2$ given by

$$\gamma(t) = (1 - 4t + 8t^2 - 3t^3, 2 + 4t - 5t^2 + 2t^3) \tag{1}$$

1. (20%) Compute its polar form.

2. (15%) Use the polar form to obtain the control points of its Bezier representation and give the Bezier representation of the curve.

3. (15%) Now consider the curve $\gamma : [-2, -1] \to \mathbb{R}^2$ given with the above formula. Obtain the control points of its Bezier representation and give the Bezier representation of the curve.

4. (20%) Compute the derivative of the Bezier curve in exercise 3.

5. (10%) Compute the tangent line to the curve in exercise 3 at $t = \frac{3}{4}$.

6. (20%) Let $P_0 = (1, 4)$, $P_1 = (2, 3)$ and $P_2 = (-1, -1)$ be the control points of a quadratic Bezier curve. Give the implicit expression $f(x, y) = 0$ of the quadratic curve on which it lies.