

4. (a) State the Bezier formula. What is the Bezier matrix for a **cubic** spline? [7]

(b) A **quadratic** spline is specified by the equation

$$\mathbf{x}(u) = \mathbf{U}\mathbf{B}^{-1}\mathbf{b}$$

where  $\mathbf{U}$  is the row matrix of powers of  $u$ ,  $\mathbf{B}^{-1}\mathbf{b}$  are the constraints for the curve. If a curve passing through the two points  $\mathbf{p}_0$  and  $\mathbf{p}_1$  is to be first-order continuous at  $\mathbf{p}_0$ , derive an expression for  $\mathbf{x}(u)$  in terms of the endpoints and  $d\mathbf{x}(u)/du$ . [12]

(c) How would you control a piecewise spline of the form given in (b)? Why might interpolating splines be preferred to approximating splines in drawing programs? [6]