1. A degree three Bezier curve $\mathbf{q}$ has control points $\mathbf{p}_0 = (0,0)$, $\mathbf{p}_1 = (0,4)$, $\mathbf{p}_2 = (4,0)$ and $\mathbf{p}_3 = (4,2)$.

(a) Draw the control polygon and the graph of $\mathbf{q}(u)$ (for $0 \leq u \leq 1$). Be sure to show the beginning and ending slopes for $\mathbf{q}(u)$ clearly.

(b) What are the values of $\mathbf{q}(0)$ and $\mathbf{q}(1)$?

$$\mathbf{q}(0) = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$$
$$\mathbf{q}(1) = \begin{pmatrix} 4 \\ 2 \end{pmatrix}$$

(c) What are the values of $\mathbf{q}'(0)$ and $\mathbf{q}'(1)$?

$$\mathbf{q}'(0) = 3(\mathbf{p}_1 - \mathbf{p}_0) = \begin{pmatrix} 0 \\ 12 \end{pmatrix}$$
$$\mathbf{q}'(1) = 3(\mathbf{p}_3 - \mathbf{p}_2) = \begin{pmatrix} 0 \\ 6 \end{pmatrix}$$

(d) What is the value of $\mathbf{q}(\frac{1}{2})$?

Calculate either by De Casteljau method or with definition in terms of Bernstein polynomials:

$$\mathbf{q}(\frac{1}{2}) = \begin{pmatrix} 2 \\ \frac{7}{4} \end{pmatrix}.$$