

Supplement to Chapter 2 of *The Science of Digital Media* – Digital Image Representation

Worksheet – Digital Imaging > Vector Graphics¹

Before completing this worksheet, you should view the on-line interactive tutorial "Vector Graphics and the Mathematics of Curves." This tutorial can be accessed at the website for *The Science of Digital Media*.

1. Bézier curves are defined by the basis matrix

$$\mathbf{M} = \begin{bmatrix} -1 & 3 & -3 & 1 \\ 3 & -6 & 3 & 0 \\ -3 & 3 & 0 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix}$$

and the geometry matrix

$$\mathbf{G} = \begin{bmatrix} \mathbf{p}_0 \\ \mathbf{p}_1 \\ \mathbf{p}_2 \\ \mathbf{p}_3 \end{bmatrix}$$

Let $\mathbf{p}_0 = (2,7)$, $\mathbf{p}_1 = (3,8)$, $\mathbf{p}_2 = (3,5)$, and $\mathbf{p}_3 = (3,6)$. Give the parametric equations $x(t)$ and $y(t)$ that would describe a Bézier curve defined by these points.

2. Evaluate the parametric equations you derived at $t = (0.5, 0.5)$.
3. Try to draw the curve in a vector graphics program.
4. Verify that the point you computed in #2 above is on the curve.

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