

Ellipses

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The Cartesian equation of an ellipse \mathcal{E} is

$$ax^2 + by^2 + cxy + dx + ey + f = 0.$$

Using the homogeneous coordinates $(x, y, 1)$, we can write the above equation as

$$\begin{bmatrix} x & y & 1 \end{bmatrix} \begin{bmatrix} a & c/2 & d/2 \\ c/2 & b & e/2 \\ d/2 & e/2 & f \end{bmatrix} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$$

Parametric equation