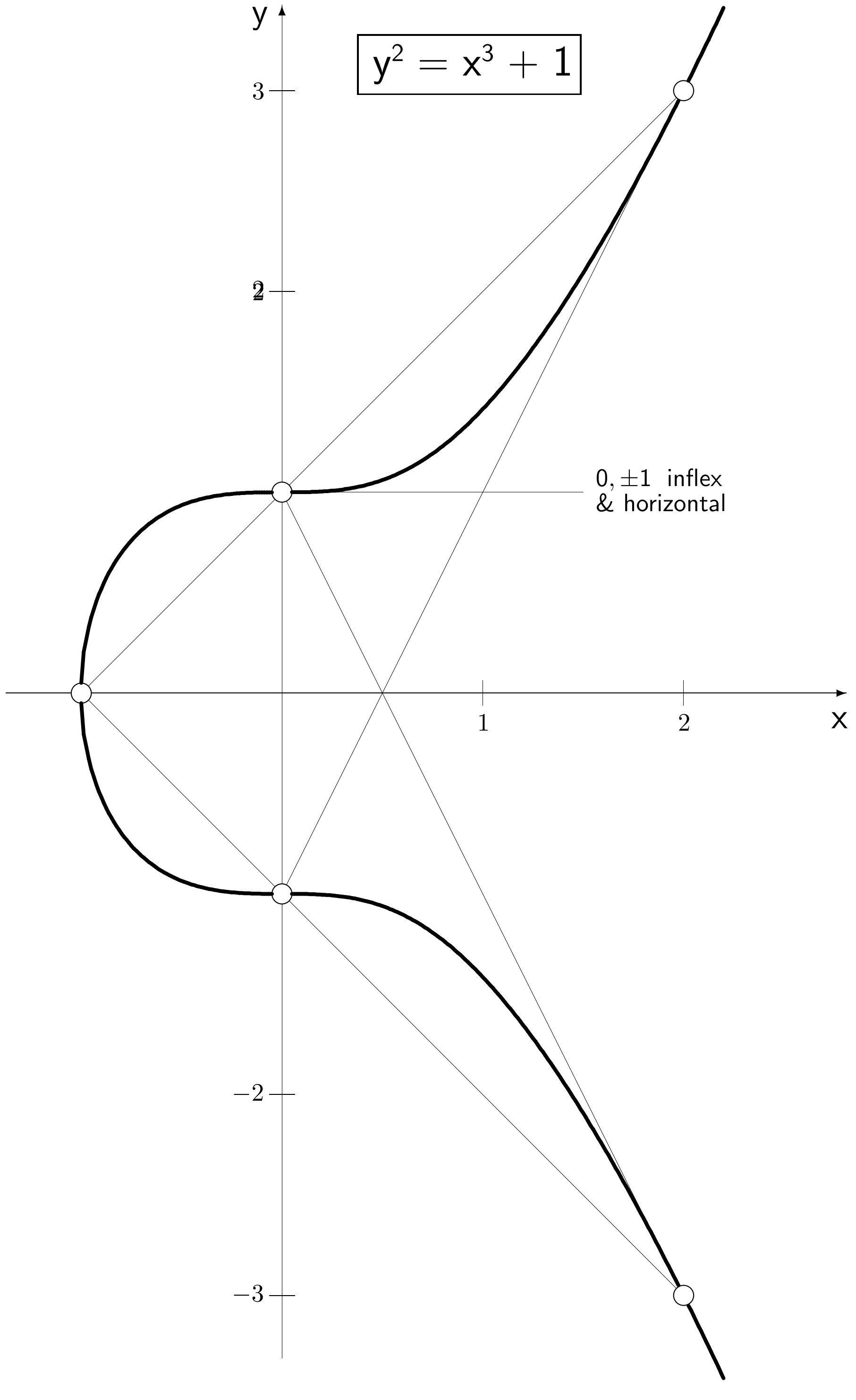
Drawing in LaTeX

— by circumventing it, taking recourse to TeX and `\special`

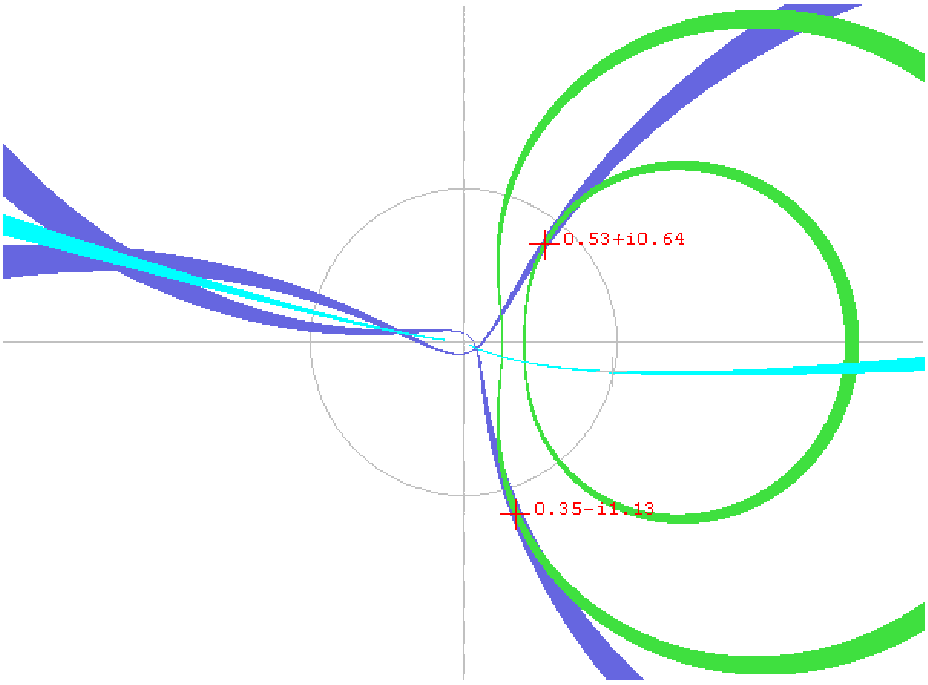


Relative Difference: an Example

$$d(A,B) := \frac{|A-B|}{|A|+|B|}\,; \quad d(0,0) := 0$$

d *is* a distance. (A peculiar kind of distance, as the valuation defined by it —$||A|| := d(A,0)$—is the trivial valuation, whereas, of course, the distance defined by the trivial valuation is not d; in fact, d cannot be derived from any valuation.)

An example of its behaviour—represented with complex numbers (could as well be represented with two-dimensional vectors):



The grey circle is the unit circle.

The red points are the base points: $A = 0.5300 + \mathbf{i}0.6400$, $B = 0.3500 - \mathbf{i}1.1300$; $d(A,B) \approx 0.8834$.

The grey point is the minimum-distance point among the points at equal distance from the base points: $\approx 0.9725 - \mathbf{i}0.1927$; its distance from A and B is ≈ 0.5175, twice the distance is ≈ 1.0349. (The point is not on the straight-line segment connecting the base points; the (ordinary, Euclidean) segment midpoint is at distance ≈ 0.6666 from A, ≈ 0.5274 from B, together ≈ 1.1940.)

The light blue curve: The points at equal distance from the base points.

The green curves: The points at equal distance from point 1 and from A, B, resp.: $d(A,1) \approx 0.4337$, $d(B,1) \approx 0.5972$, together ≈ 1.0308. (Less than the midpoint-distance sum; moreover, even less than twice the minimum distace.)

The dark blue curves: The points that are at the same distance from A, B, resp., as A and B are from each other, that is, ≈ 0.8834. The intersection points of the curves (three of them are visible in the figure, there is a fourth one to the right) are at distance $d(A,B)$ from both A and B. (So four equilateral triangles can be constructed with a common edge.)

The stroke width varies according to the flatness of the function: it covers all the points that meet the condition within a given *absolute* ε $(= 0.0075)$.