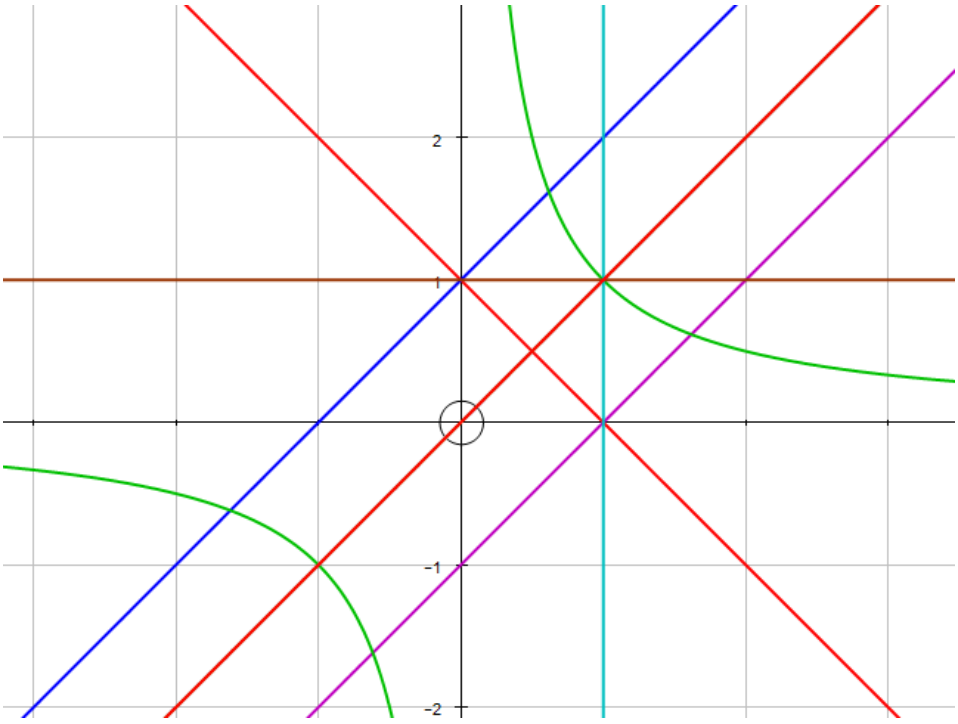
Risp 34: Teacher Notes

Suggested use: to introduce/consolidate/revise curve-sketching, co-ordinate geometry, simultaneous equations

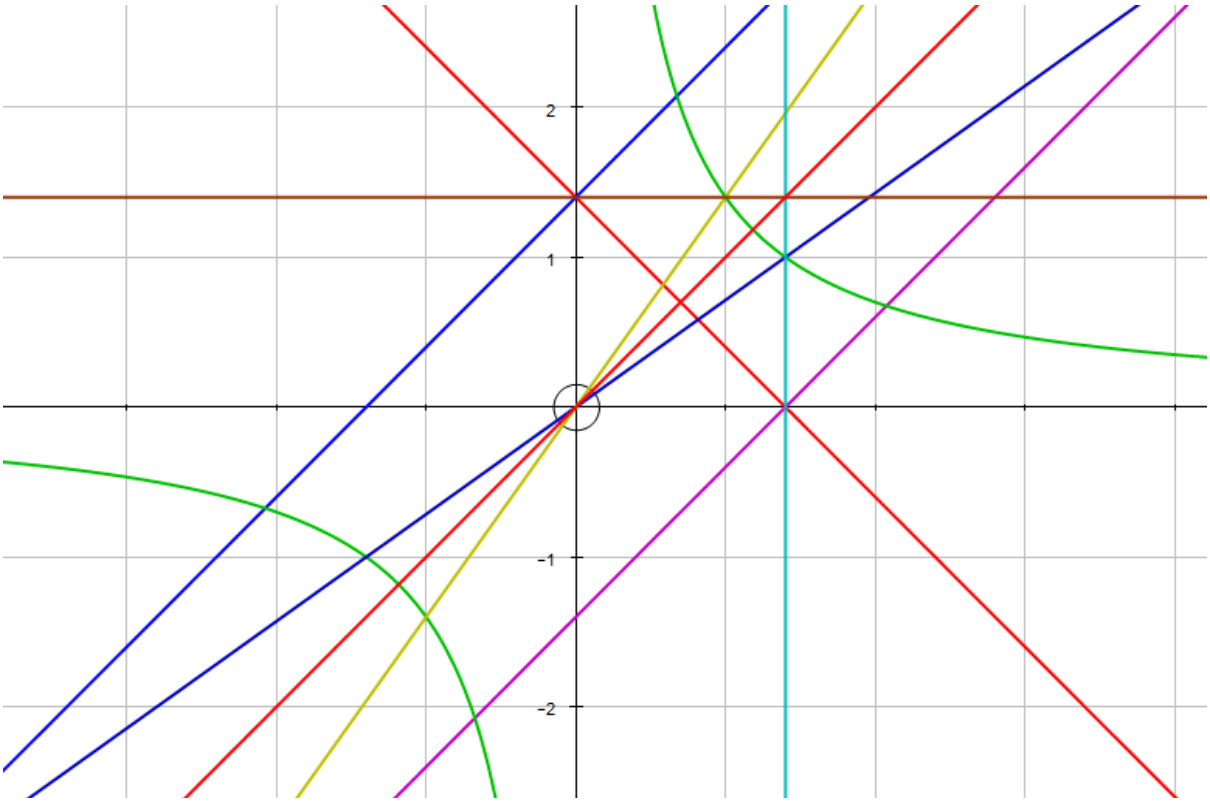
It turns out that using the given tiles, nine reasonable equations fit for graphing are possible.

$$x + y = c$$
$$x + c = y$$
$$y + c = x$$
$$xy = c$$
$$x = cy$$
$$y = cx$$
$$x = c$$
$$y = c$$
$$x = y$$

Plotting these into Autograph gives the following initial picture:



Then increasing c slightly gives this:



Four of the nine curves are collinear only if c = 0.

Three of the lines enclose an equilateral triangle when c = tan 15°.

Its area? y = cx and x + y = c meet at $\left(\frac{c}{1+c}, \frac{c^2}{1+c}\right)$,
so the length of side is 0.218779..., so the area of the triangle is 0.0207.

Another equilateral triangle is formed when c = tan 75°.

A line touches a curve when x + y = c touches xy = c, that is, when c = 4.

The touching point is (2, 2).

I would get students to observe this on the graph, then to check with algebra.

If c = -4, we find the curve xy = c is touched by two lines, at (2, -2) and (-2, 2).

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