Risp 17: Six Parabolas

Type the equation $y = ax^2 + bx + c$ into your graphing package.

Your graphing package will read a, b and c as variables, and gives them all the value 1 to start with.

Now mix up a, b and c to give all possible orders.

For example, $y = bx^2 + cx + a$ is one possible order.

You will get a further five equations:
type these into your graphing package too.

Your graphing package will plot $y = x^2 + x + 1$ each time.

Now try varying a, b, and c using the Constant Controller.
You should find you have six different parabolas
if a, b and c are all different.
Do these six parabolas have anything in common?

Can you find a, b and c so that:
1. all the lines of symmetry are to the left of the y-axis?
2. all the lines of symmetry are to the right of the y-axis?
3. all six parabolas have two solutions for y = 0?
4. none of the six parabolas have a solution for y = 0?
5. exactly one of the parabolas touches the x-axis?

What is special about the vertical lines x = 0 and x = -1?
Can you explain this?

*Show that if a, b and c are rational,
then any point where a pair of parabolas cross has rational coordinates.*

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