

cyclic order around the right hand root point. (Compare Remark 2.30.) In fact they always seem to land as indicated, with

$$\alpha' = \widehat{\beta}, \quad \beta' = \widehat{\gamma}, \quad \text{and} \quad \delta' = \widehat{\alpha}.$$

Recall that α and γ always belong to the same grand orbit, which also contains $\widehat{\gamma} = \beta'$. It follows that α and β' belong to the same grand orbit: $((\alpha)) = ((\beta'))$. Similarly, since β and δ belong to the same orbit, and $\alpha' = \widehat{\beta}$, consequently $((\alpha')) = ((\beta))$. Assuming as in Equation (12) that $((\alpha)) \neq ((\beta))$ it follows that

$$((\alpha)) = ((\gamma)) = ((\beta')) = ((\delta')) \neq ((\alpha')) = ((\gamma')) = ((\beta)) = ((\delta)).$$

The key to understanding this situation is to look at the Julia set for the parabolic root points. Since the two root points of an A component are dual to each other, they have Julia sets which are identical, except for the choice of which component to label as a and which to label as $-a$.

Nearly all of the examples we know are for rabbit regions. As one specific example, let us concentrate on the $1/3$ -rabbit region as shown in Figure 54, and on the A component in the upper left of this Figure. Figure 60 illustrates the Julia set for either of its two root points. (See Figure 21 for an analogous Julia set for the $1/2$ rabbit, and Figure 23 for the $1/5$ rabbit.)

Given any co-periodic angle θ with denominator $3(3^p - 1)$, it is useful to consider the corresponding periodic angle 3θ with denominator $3^p - 1$. Note that two co-periodic angles θ and θ' satisfy $3\theta = 3\theta'$ if and only if they are twins.

In our example, the root point of each $\pm 2a$ component in the Julia set is the landing point of six dynamic rays. However, only four of the six dynamic angles correspond to parameter angles for rays landing at the specified root point of A. Below is a table describing the angles for the six dynamic rays landing at the left hand root point in Figure 54 (or 60), and specifying which four are the angles of parameter rays landing on a root of A.

	γ			δ	α	β	
angles :	16	19	22	31	40	41	/78
$\times 3 :$	16	19	22	5	14	15	/26

Here is the corresponding table for the right hand root points.

	α'	β'	γ'		δ'	
angles :	67	68	71	74	5	14 /78
$\times 3 :$	15	16	19	22	5	14 /26

Evidently the last row of the second table is just the last row of the first table permuted cyclically. It follows that the angles in the second table are just the twins of the angles in the first table, again permuted cyclically. In particular

$$\alpha' = \widehat{\beta}, \quad \beta' = \widehat{\gamma}, \quad \text{and} \quad \delta' = \widehat{\alpha}.$$

However the twin $\widehat{\delta}$ is an angle which does not correspond to any parameter ray landing at a root point of this A component, and the same is true for $\widehat{\gamma'}$.