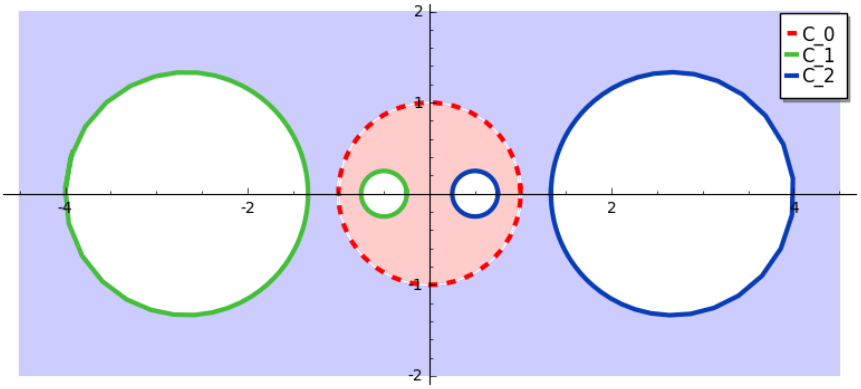
February 1, 2016

1 Setup

With the group data $\delta = [-1/2, 1/2], q = [1/4, 1/4]$ we get the following image of D_ζ and D'_ζ. The union of



the red shaded region and the purple shaded region is the fundamental domain, F.

2 Results

All current tests (15/1/31) passed in all cases of `product_threshold`

product_threshold	build ω time (s)	slitmap time (s)	abs((5.17))	approx branch pts
2	3.2	0.99	0.85	[(-3.549561, -1.002919), (1.003466, 6.763318)]
3	0.40	1.5	2.5	[(-1.036200, -1.002797), (1.003321, 1.048239)]
4	0.72	2.2	4.1	[(-1.036062, -1.002788), (1.003332, 1.048425)]
5	0.95	3.1	5.2	[(-1.035680, -1.002785), (1.003328, 1.047908)]
6	1.4	4.4	5.9	[(-1.035676, -1.002785), (1.003329, 1.047912)]
7	2.0	6.4	6.3	[(-1.035669, -1.002785), (1.003329, 1.047903)]
8	3.1	11.	6.5	[(-1.035669, -1.002785), (1.003329, 1.047903)]
9	5.5	30.	6.6	[(-1.035668, -1.002785), (1.003329, 1.047902)]
10	13.	110.	6.7	[(-1.035668, -1.002785), (1.003329, 1.047902)]
11	37.	310.	6.8	[(-1.035668, -1.002785), (1.003329, 1.047902)]

We get the following figures
These figures are clearly showing something bad. The circles should be collapsing to intervals. Look at more detail for product_threshold = 3 after using the control of product_threshold = 1 and product_threshold=2 (which look like I would expect.)

2.1 Results - product_threshold=1

We get the following images:

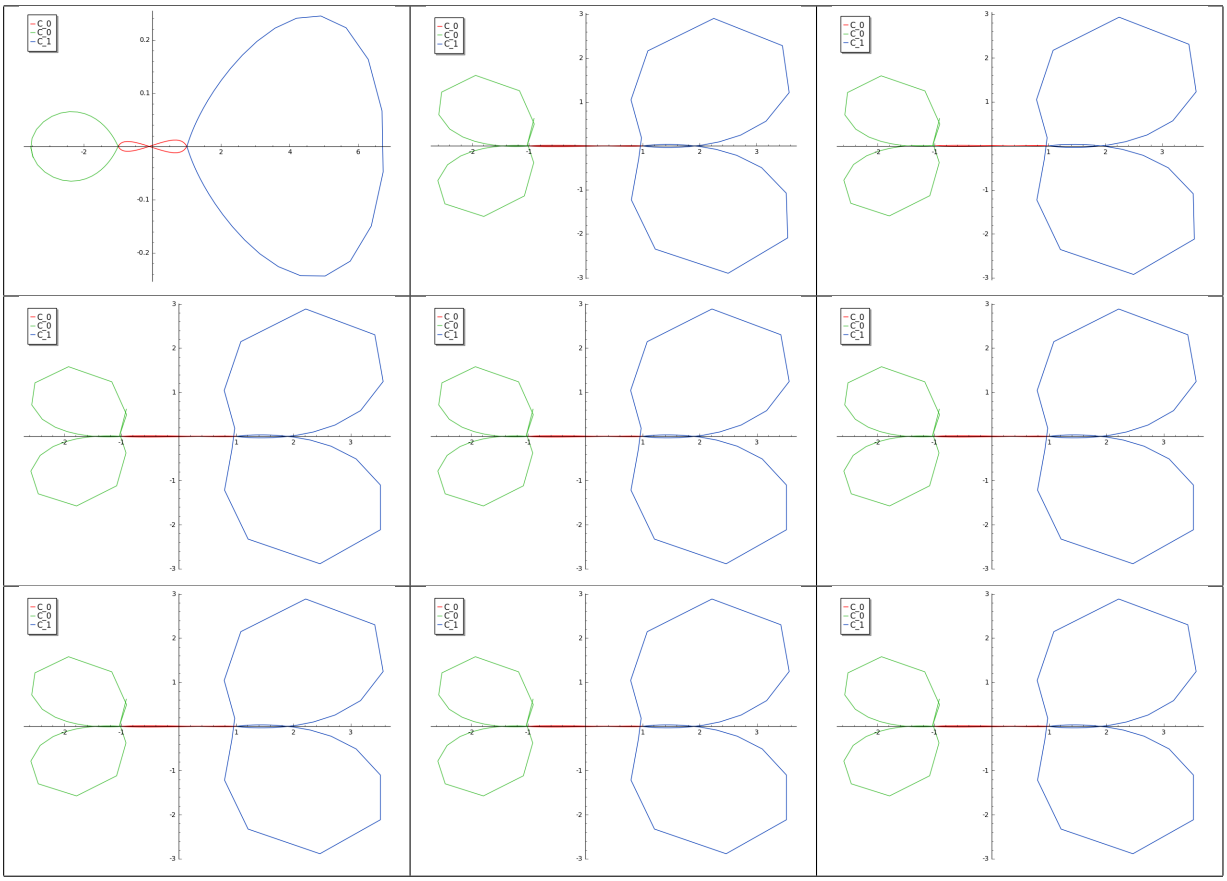


Table 1: For product_threshold = 2,...,10, left to right top to bottom.

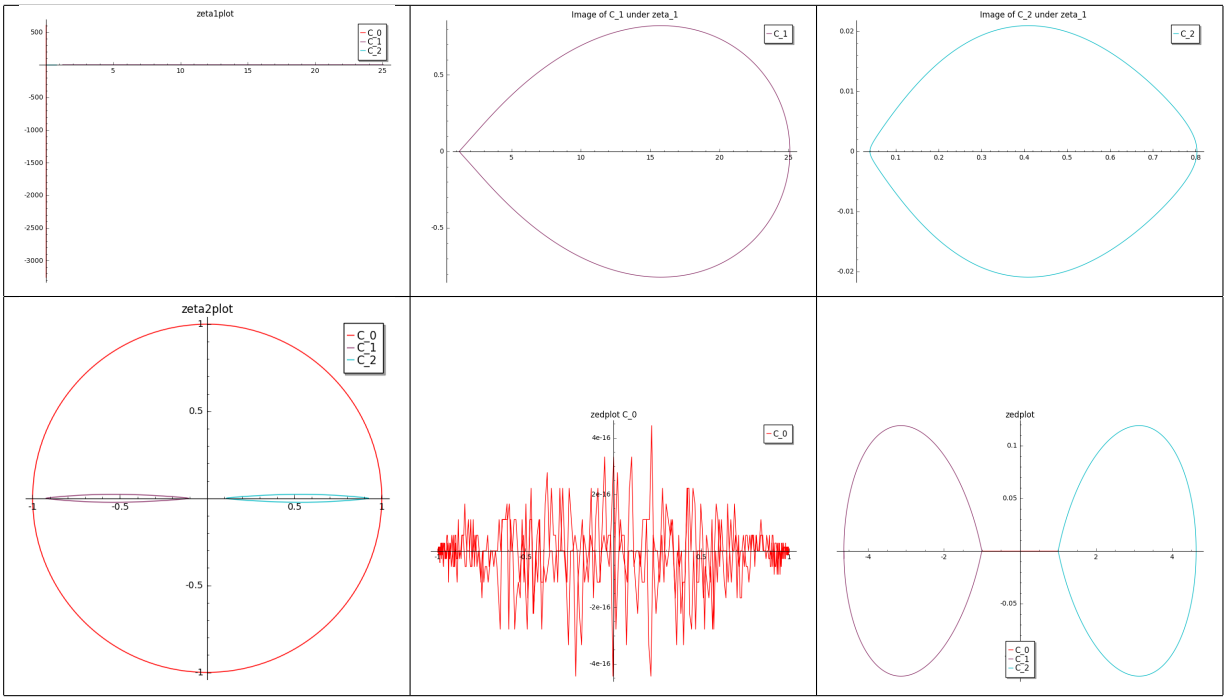


Table 2: product_threshold=1

2.2 Results - product_threshold=2

We get the following images:

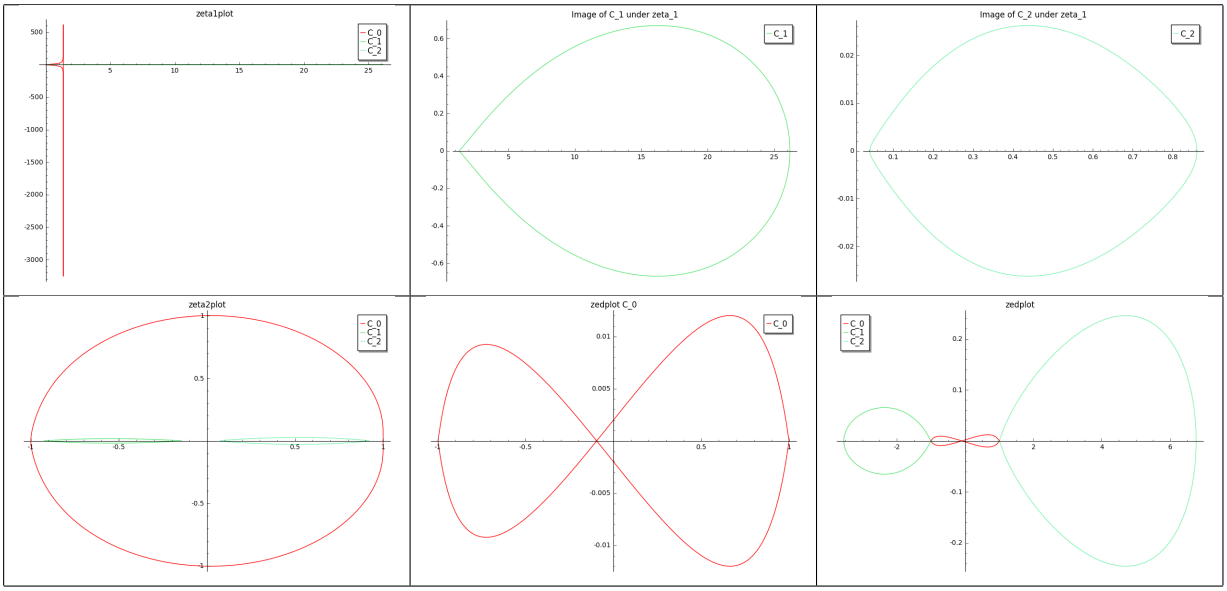


Table 3: product_threshold=2

2.3 Results - product_threshold=3

We get the following images:

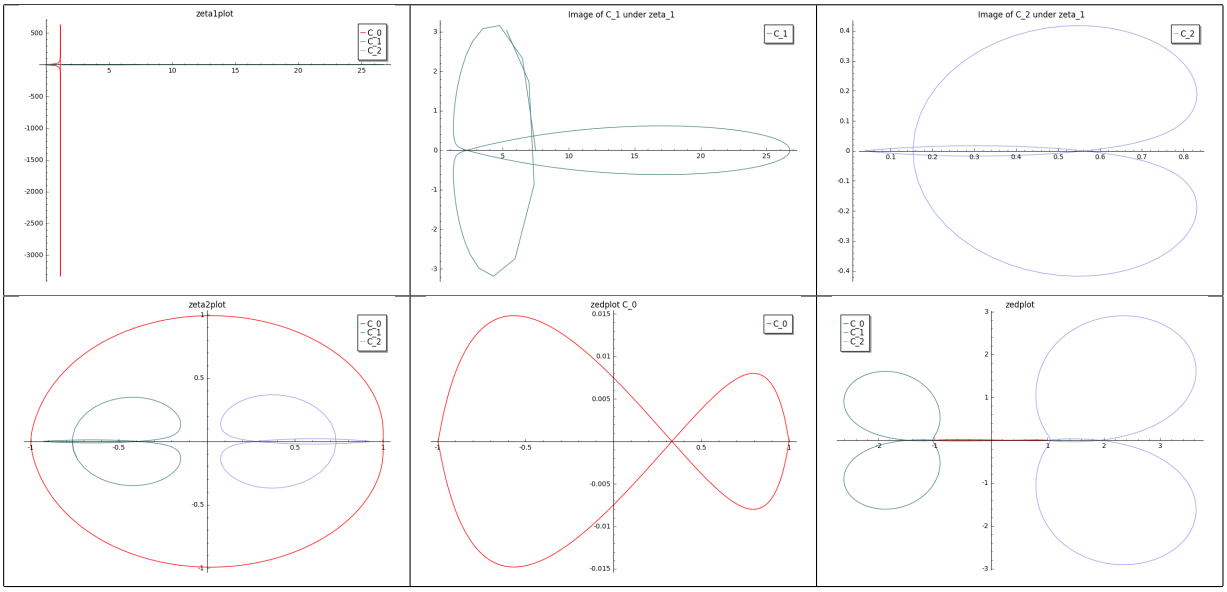


Table 4: product_threshold=3

Something weird is happening to the C_j under ζ_1, it is blowing up far too much. However the image of C_0 is behaving as we expect.
If we read page 190 of the text, we see that the two relations (5.10) and (5.17) satisfied by the prime function together show that $\zeta_1(\zeta) = \zeta_1(\zeta)$ for ζ on C_j. I.e. each circle C_j should map to the real ζ_1 axis! This should

be checked.

2.3.1 Using only the word ϕ_1^3

We get the following images:

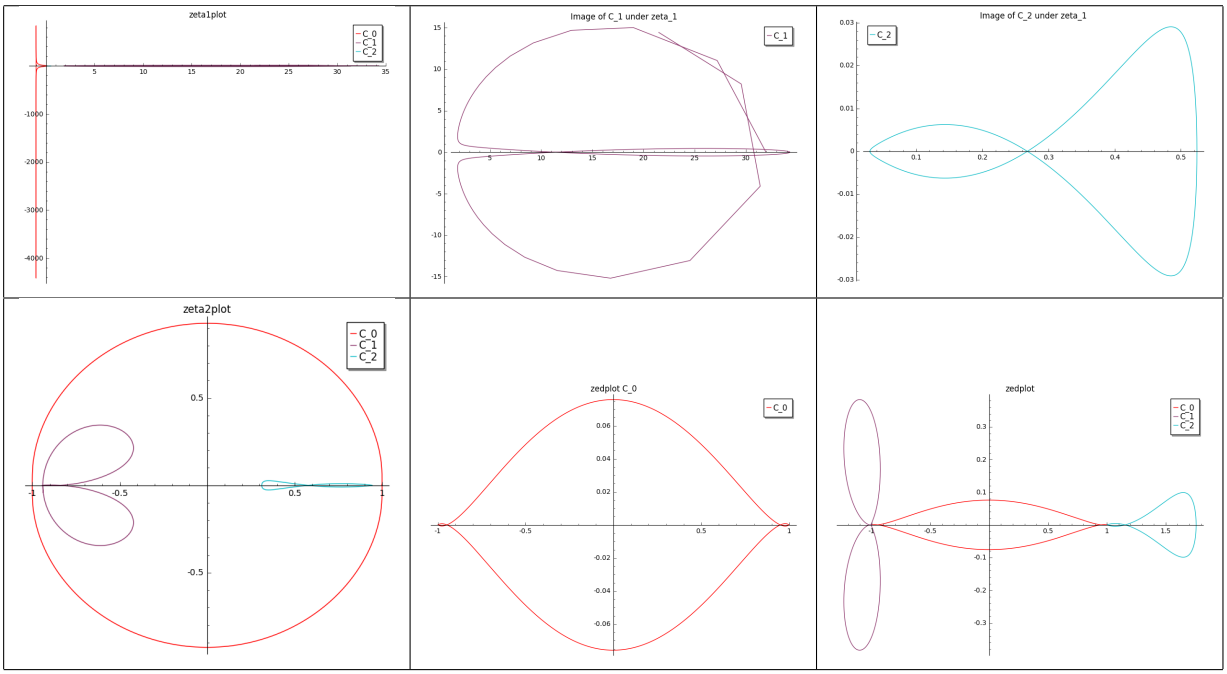


Table 5: product_threshold=3, ϕ_1^3 only

2.3.2 Using only the word $\phi_1^2 * \phi_2$

We get the following images:

2.3.3 Using only the word $\phi_1 * \phi_2 * \phi_1$

We get the following images: Notice that this is the exact same as above! Because the functions are all abelian!

2.3.4 Using only the word $\phi_1 * \phi_2^2$

We get the following images:

2.3.5 Using only the word $\phi_2 * \phi_1^2$

This looks exactly the same as the word $\phi_1^2\phi_2$ for example, so the plots are omitted. Further plots are also omitted!

3 Something is strange here. Shouldn't these maps be symmetric? Why would they not be? Plot just ϕ_1 and ϕ_2

3.1 ϕ_1

The code gives: `phi_i = 1/8*z/(z+2)-1/2` and

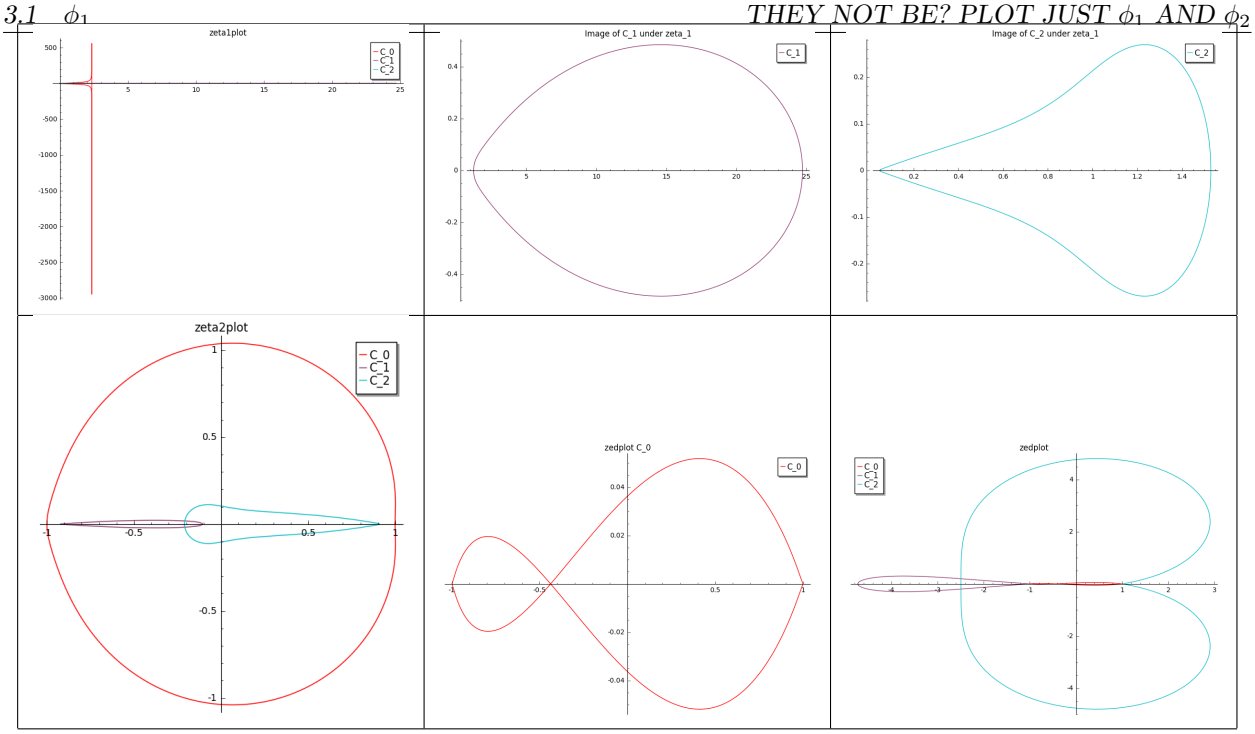


Table 6: product_threshold=3, $\phi_1^2 * \phi_2$ only

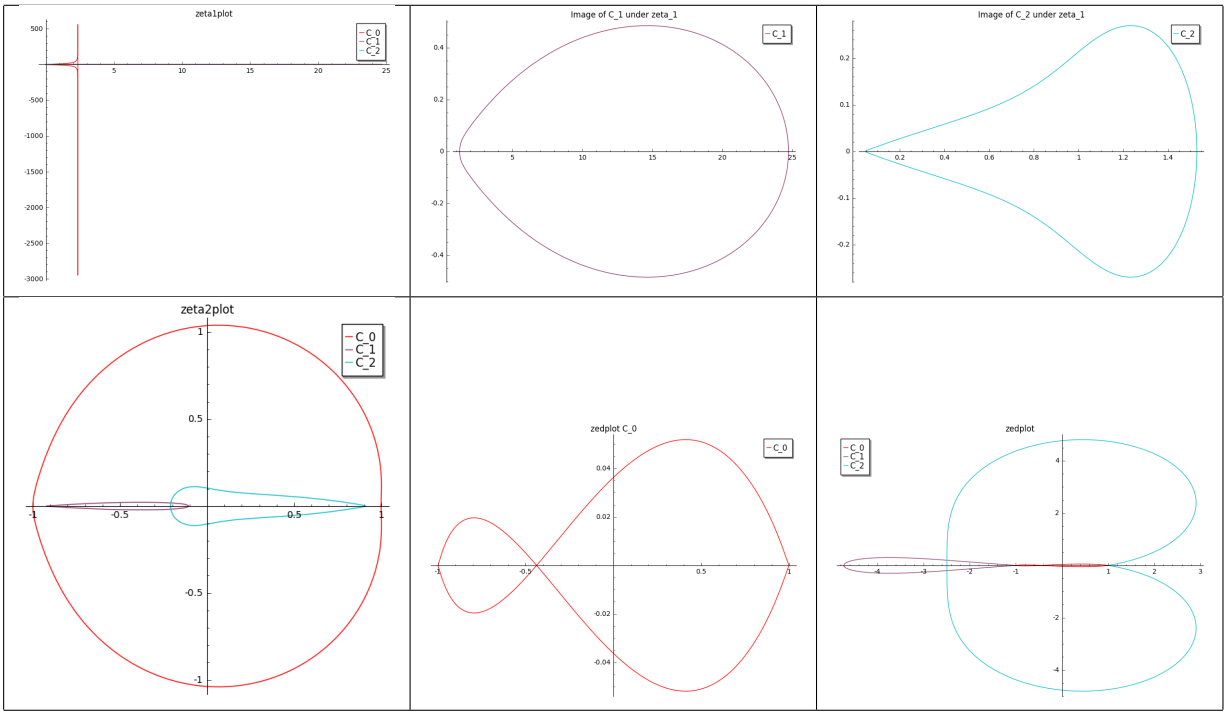


Table 7: product_threshold=3, $\phi_1 * \phi_2 * \phi_1$ only

```
omegap=(8*gamma - z/(z + 2) + 4)*(8*z - gamma/(gamma + 2) + 4)/
                        ((8*gamma - gamma/(gamma + 2) + 4)*(8*z - z/(z + 2) + 4)).
```

We get the following images:

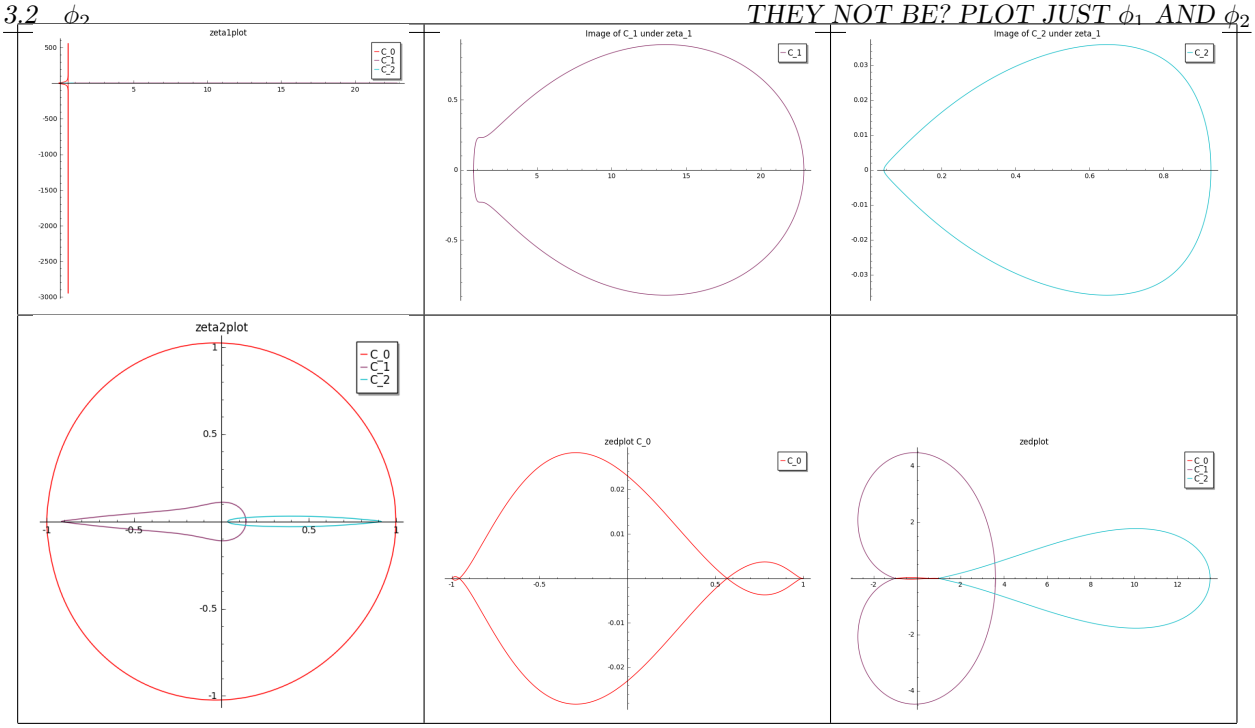


Table 8: product_threshold=3, $\phi_1 * \phi_2^2$ only

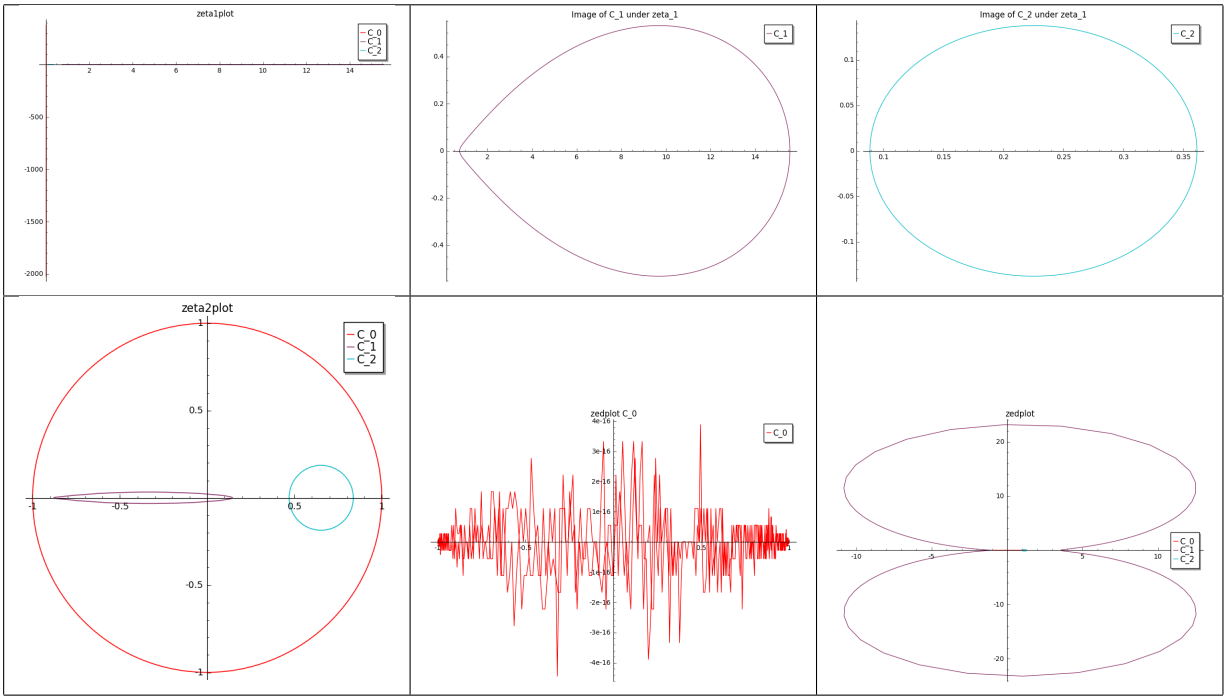


Table 9: product_threshold=1, ϕ_1 only

3.2 ϕ_2

The code gives: `phi_i = -1/8*z/(z-2)+1/2` and

```
omegap=(8*gamma + z/(z - 2) - 4)*(8*z + gamma/(gamma - 2) - 4)
                        /((8*gamma + gamma/(gamma - 2) - 4)*(8*z + z/(z - 2) - 4)).
```

We get the following images:

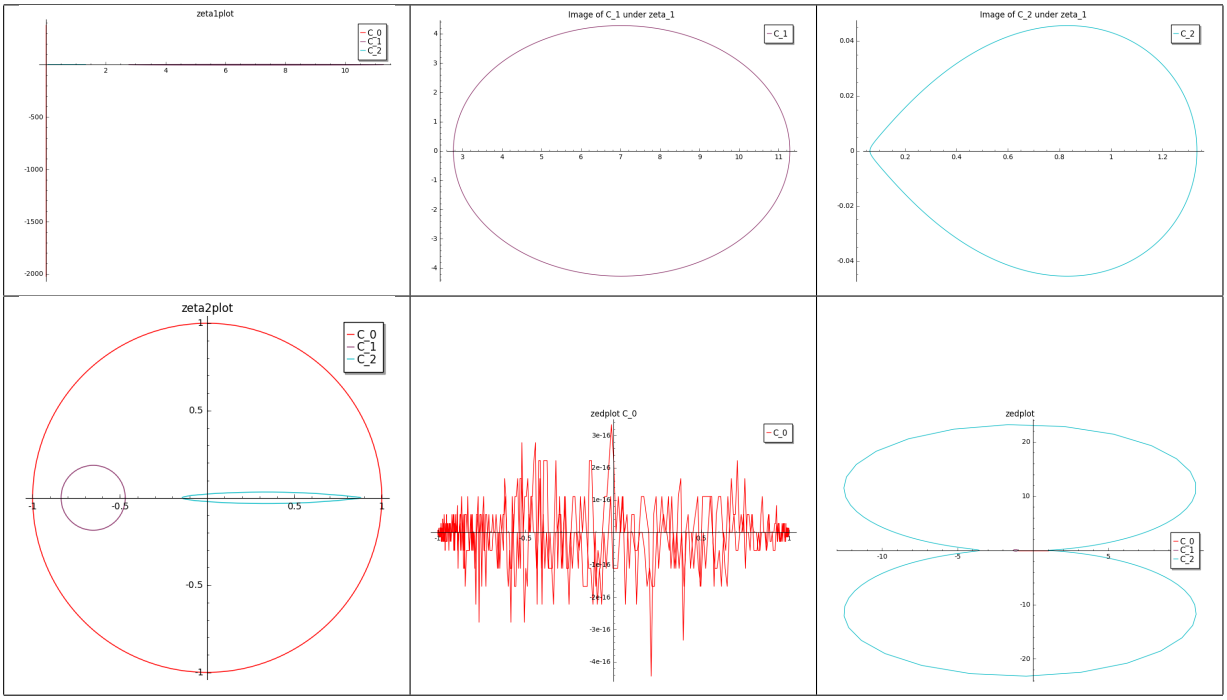


Table 10: product_threshold=1, ϕ_2 only