Hausaufgabenserie 8

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Aufgabe 1

$\circ$	a_1	a_2	a_3	a_4	a_5	a_6
a_1	a_1	a_2	a_3	a_4	a_5	a_6
a_2	a_2	a_1	a_5	a_6	a_3	a_4
a_3	a_3	a_6	a_1	a_5	a_4	a_2
a_4	a_4	a_5	a_6	a_1	a_2	a_3
a_5	a_5	a_4	a_2	a_3	a_6	a_1
a_6	a_6	a_3	a_4	a_2	a_1	a_5

$$e_{S_3} = a_1 \tag{1}$$
$$a_1^{-1} = a_1 \tag{2}$$
$$a_2^{-1} = a_2 \tag{3}$$
$$a_3^{-1} = a_3 \tag{4}$$
$$a_4^{-1} = a_4 \tag{5}$$
$$a_5^{-1} = a_6 \tag{6}$$
$$a_6^{-1} = a_5 \tag{7}$$

Aufgabe 2

(a)

$$a_5 \circ a_3 = a_2 \tag{1}$$
$$a_2 \circ x \circ a_2 = a_4 \tag{2}$$
$$\implies x \circ a_2 = a_6 \tag{3}$$
$$\implies x = a_3 \tag{4}$$

(b)

$$x^2 \circ a_2 = a_4 \tag{5}$$
$$x \circ x \circ a_2 = a_4 \tag{6}$$
$$y \circ a_2 = a_4 \tag{7}$$
$$\implies y = a_5 \tag{8}$$
$$y = x \circ x \tag{9}$$
$$\implies x = a_6 \tag{10}$$

Aufgabe 3

(a)

$$2^{2017} \equiv \left(2^{16}\right)^{64} \cdot 2^{993} \mod 17 \tag{1}$$
$$2^{2017} \equiv \left(2^{16}\right)^{32} \cdot 2^{481} \mod 17 \tag{2}$$
$$2^{2017} \equiv \left(2^{16}\right)^{16} \cdot 2^{225} \mod 17 \tag{3}$$
$$2^{2017} \equiv \left(2^{16}\right)^{8} \cdot 2^{97} \mod 17 \tag{4}$$
$$2^{2017} \equiv \left(2^{16}\right)^{4} \cdot 2^{33} \mod 17 \tag{5}$$
$$2^{2017} \equiv \left(2^{16}\right)^{2} \cdot 2^{1} \mod 17 \tag{6}$$
$$2^{2017} \equiv 2 \mod 17 \tag{7}$$
$$\implies 2^{2017} \mod 17 = 2 \tag{8}$$

(b)

$$5^{2017} \equiv 5^2 \cdot 5^{2014} \cdot 5 \mod 12 \tag{9}$$
$$\equiv 1 \cdot \left(5^2\right)^{1007} \cdot 5 \mod 12 \tag{10}$$
$$\equiv 1^{1007} \cdot 5 \mod 12 \tag{11}$$
$$\equiv 5 \mod 12 \tag{12}$$
$$\implies 5^{2017} \mod 12 = 5 \tag{13}$$