Graphs of mod 1000 on powers of 2 to 9

- Exponents = {0,1,2... 10001 }
- Objects = { 2, 3, 4, 5, 6, 7, 8, 9, }
- Object_Power_Sets = { {x^{exp}} | x ∈ Objects ; exp ∈ Exponents }
- Cycle_Sets = { {o mod 1000 } | o ∈ O ; O ∈ Object_Power_Sets }

Elements of Cycle_Sets

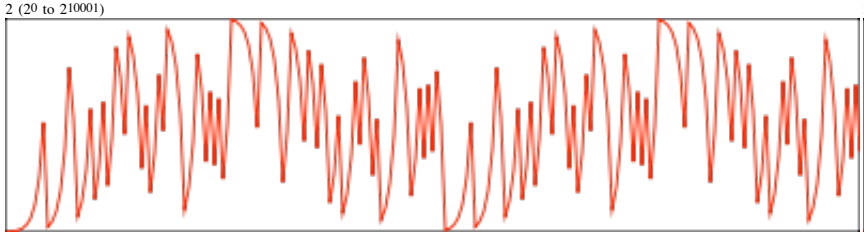
These sets form a Group under the operation $\otimes_{1000}(x,y)$ = (x *y) mod 1000. For identity element derivation see below.

- $Cycle\_Set_2$ = {8,16,32,64,128,256,512,24,48,96,192,384,768,536,72,144,288,576,152,304,608,216,432,864,728,456,912,824,648,296,592,184,368,736,472,944,888,776,552,104,208,416,832,664,328,656,312,624,248,496,992,984,968,936,872,744,488,976,952,904,808,616,232,464,928,856 [count=100] (show table)
- $Cycle\_Set_3$ = {1,3,9,27,81,243,729,187,561,683,49,147,441,323,969,907,721,163,489,467,401,203,609,827,481,443,329,987,961,883,649,947,841,523,569,707,121,363,89,267,801,403,209,627,881,643,929,787,361,83,249,747,241,723,169,507,521,563,689,67,201,603,809,427,281,843,52 [count=100] (show table)
- $Cycle\_Set_4$ = {16,64,256,24,96,384,536,144,576,304,216,864,456,824,296,184,736,944,776,104,416,664,656,624,496,984,936,744,976,904,616,464,856,424,696,784,136,544,176,704,816,264,56,224,896,584,336,344,376,504} [count=50] (show table)
- $Cycle\_Set_5$ = {125,625} [count=2] (show table)
- $Cycle\_Set_6$ = {216,296,776,656,936,616,696,176,56,336,16,96,576,456,736,416,496,976,856,136,816,896,376,256,536} [count=25] (show table)
- $Cycle\_Set_7$ = {1,7,49,343,401,807,649,543,801,607,249,743,201,407,849,943,601,207,449,143} [count=20] (show table)
- $Cycle\_Set_8$ = {8,64,512,96,768,144,152,216,728,824,592,736,888,104,832,656,248,984,872,976,808,464,712,696,568,544,352,816,528,224,792,336,688,504,32,256,48,384,72,576,608,864,912,296,368,944,552,416,328,624,992,936,488,904,232,856,848,784,272,176,408,264,112,896,168,3 [count=100] (show table)
- $Cycle\_Set_9$ = {1,9,81,729,561,49,441,969,721,489,401,609,481,329,961,649,841,569,121,89,801,209,881,929,361,249,241,169,521,689,201,809,281,529,761,849,641,769,921,289,601,409,681,129,161,449,41,369,321,889} [count=50] (show table)

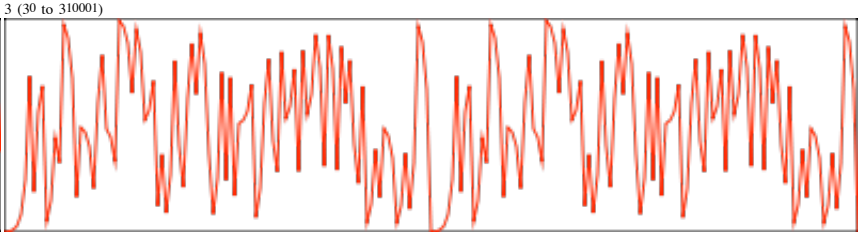
Horizontal View (back to top)

Last 3 digit(s) for powers of

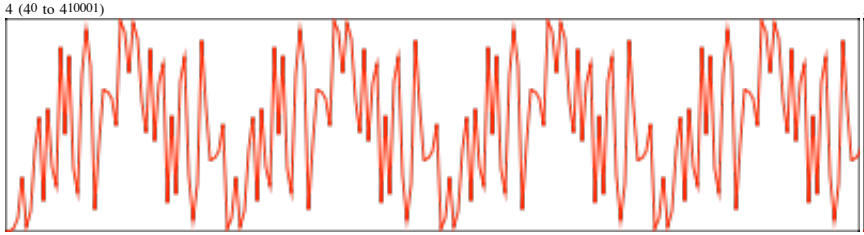
2 (2^0 to 2^{10001})



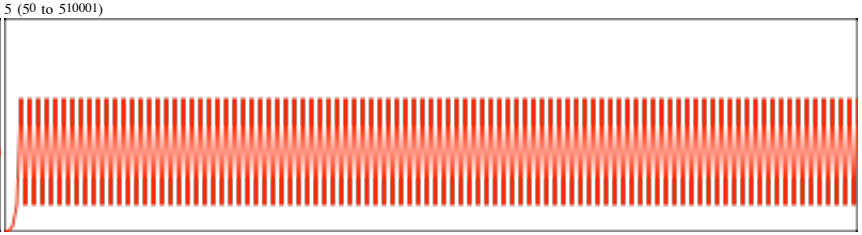
3 (3^0 to 3^{10001})



4 (4^0 to 4^{10001})



5 (5^0 to 5^{10001})



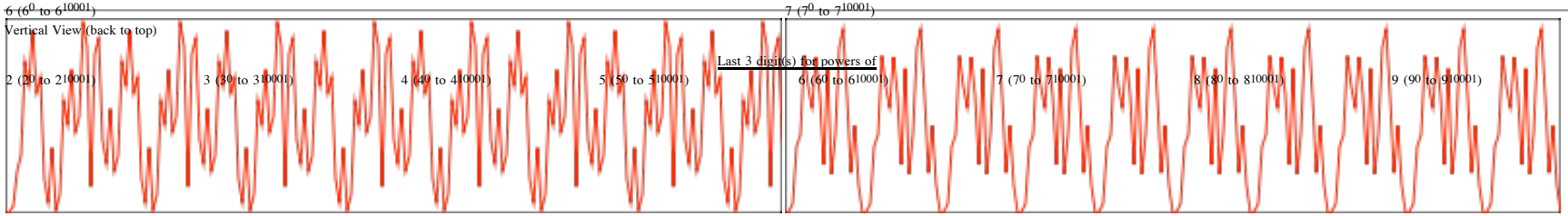
6 (6^0 to 6^{10001})

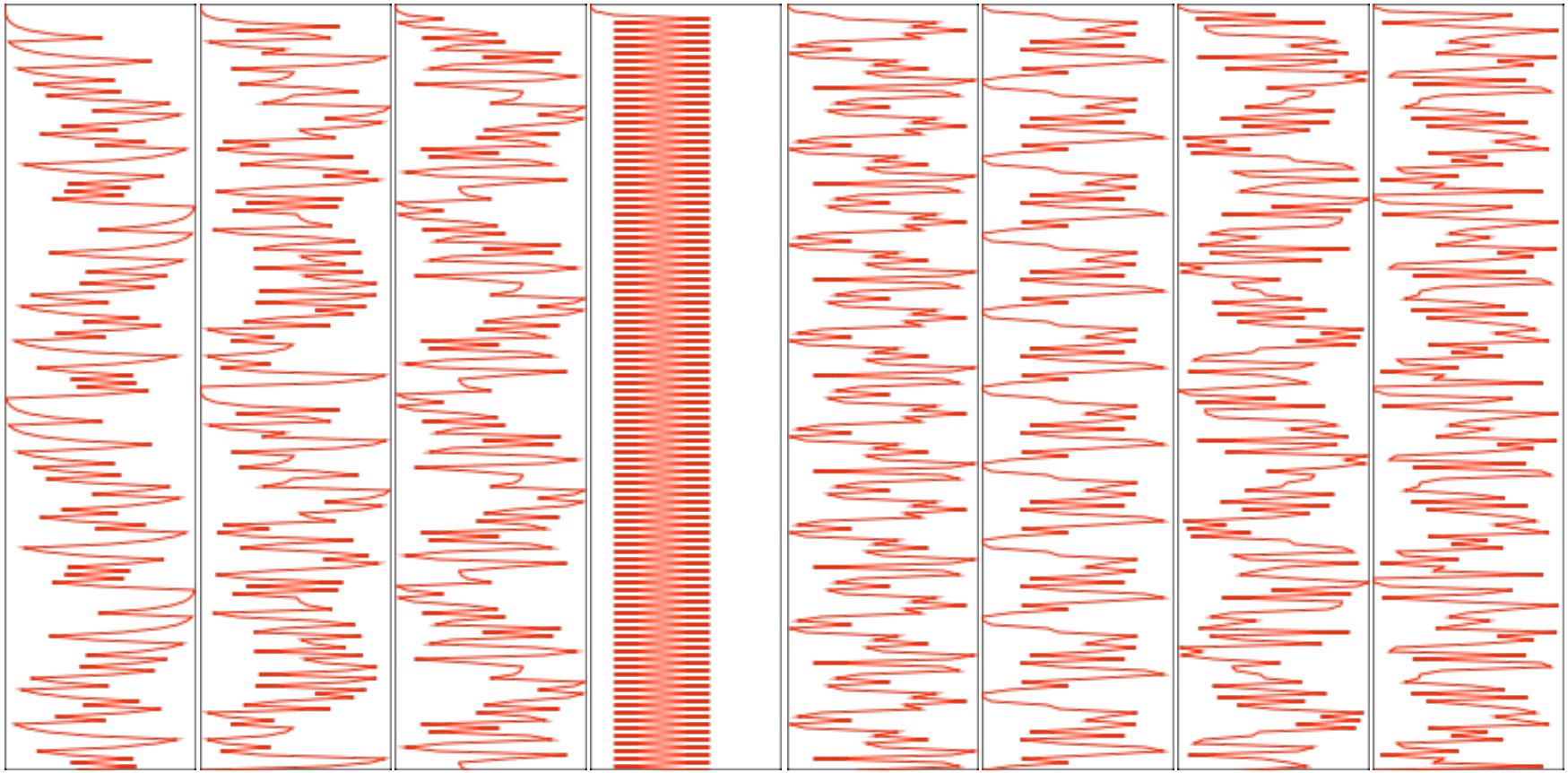
7 (7^0 to 7^{10001})

Vertical View (back to top)

Last 3 digit(s) for powers of

2 (2^0 to 2^{10001}) 3 (3^0 to 3^{10001}) 4 (4^0 to 4^{10001}) 5 (5^0 to 5^{10001}) 6 (6^0 to 6^{10001}) 7 (7^0 to 7^{10001}) 8 (8^0 to 8^{10001}) 9 (9^0 to 9^{10001})





Identity element

The members in the cycle set (say x, y, z) will be a subset of Numbers= {0,1,2,3,...98, 99, ...,1000}.
With the operator $\otimes_{1000}$ (x,y) = (x * y) mod 1000, the search for identity element proceeds as follows:

- Let x be the identity element of a cycle set, then for any y from the cycle set, (x * y) mod 1000 = y. This is possible with x=1+u (u ∈ Numbers). Then
  (x*y) mod 1000
  = (y+ u*y) mod 1000
  = y mod 1000 + (u*y) mod 1000
  = y + (u*y) mod 1000
  need to find smallest u such that u*y to be a multiple of 1000, then (u*y) mod 1000 = 0

  - An element y from $Cycle\_Set_2$ or $Cycle\_Set_4$ or $Cycle\_Set_6$ or $Cycle\_Set_8$ is a multiple of 8,
    then (x*y) mod 1000
    = (y+ 8*u*z) mod 1000
    = y mod 1000 + (8*u*y) mod 1000
    = y + (8*u*y) mod 1000
    need 8*u*y to be multiple of 1000, irrespective of y (member of cycle set)
    that is possible with u= 125 (x=126) or u=250 (x=251) or u=375 (x=376),of this x=376 (u=375) is a member of the cycle sets
    ∴ ***376*** is the identity element for the cycle sets mentioned above

  - For $Cycle\_Set_3$ or $Cycle\_Set_7$ or $Cycle\_Set_9$,
    then (x*y) mod 1000
    = (y+ u*y) mod 1000
    = y mod 1000 + (u*y) mod
    = y + (u*y) mod 1000
    need u*y to be multiple of 1000, irrespective of y (member of cycle set)
    that is possible with u= 0 (x=1) or u=999 (x=1000), but x=1000 (u=999) is not a member of these sets

$\therefore$ ***1*** is the identity element for the cycle sets mentioned above

- Elements of $Cycle\_Set_5$ are multiples of 125.
  then (x*y) mod 1000
  = (y+ 125*u*z) mod 1000
  = y mod 1000 + (125*u*z) mod
  = y + (125*u*z) mod 1000
  need u*y to be multiple of 1000, irrespective of y (member of cycle set)
  that is possible with u=624 (x=625) a member of the cycle set
  $\therefore$ ***625*** is the identity element for the $Cycle\_Set_5$