①

$$
\begin{array}{ccccccccccccccc}
 & & & & & & & 1 & & & & & & & \\
 & & & & & & 1 & & 1 & & & & & & \\
 & & & & & 1 & & 2 & & 1 & & & & & \\
 & & & & 1 & & 3 & & 3 & & 1 & & & & \\
 & & & 1 & & 4 & & 6 & & 4 & & 1 & & & \\
 & & 1 & & 5 & & 10 & & 10 & & 5 & & 1 & & \\
 & 2 & & 6 & & 15 & & 20 & & 15 & & 6 & & 1 & \\
1 & & 7 & & 21 & & 35 & & 35 & & 21 & & 7 & & 1 \\
\end{array}
$$

If you plot the odd coefficients as red, and evens as black, you get the Sierpinski triangle, which is a fractal

② (i) This seems to converge to 0 because the first 10 terms are all decreasing and getting closer to 0.

(ii) This seems to tend to 0.5999 or 0.6000

(iii) This seems to tend to an orbit of length 2 with the values 0.55 and 0.76

(iv) This seems to tend to an orbit of length 4 with the values 0.87, 0.38, 0.82, and 0.50.

③ Two mathematical constants which express ratios in a bifurcation diagram for a non-linear map