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Partial sums and geometric series.

Starting with the geometrical series, a partial sums method is developed for n terms where each term is raised to the power of m, first considering $m \in N$, and then $m \in R$.

The explanation of the method begins with the generalization of a class of Bernoulli's partial sums, extending it then to any $m \in N$.

Defining generating functions, the method is extended to the sums of natural numbers alternating in sign, sums of odd natural numbers and sums of odd natural numbers alternating in sign. Furthermore, such generating functions admit an additional generalization, which allows finding a set of partial sums of the geometrical series. These partial sums, depends on two parameters which are $m \in R$ and $b \in R^+$, where R^+ are all positive reals excluding 0.

An application for $m < 0$ is the computation of an integral expression of partial sums of the Reimann ζ function, where $b = 1$ and $m < -1$. This methodology is used to calculate the integral expression for partial sums of natural numbers, where each term of the sum is raised to any $m \geq 0$ power. (Received September 23, 2012)