Hence solving for the first few coefficients $a_n$

Substituting for $a_n$ in Eq. (18) we obtain

Now to equate the coefficients of like powers of $(x - 1)$ we must express $x$, the coefficient of $y$ in Eq. (12), in powers of $x - 1$; that is, we write $x = 1 + (x - 1)$. Note that this is precisely the Taylor series for $x$ about $x = 1$. Then Eq. (18) takes the form

Shifting the index of summation in the second series on the right gives

Equating coefficients of like powers of $x - 1$, we obtain

The general recurrence relation is

Solving for the first few coefficients $a_n$ in terms of $a_0$ and $a_1$, we find that

Hence

In general, when the recurrence relation has more than two terms, as in Eq. (19), the determination of a formula for $a_n$ in terms of $a_0$ and $a_1$ will be fairly complicated, if not impossible. In this example such a formula is not readily apparent. Lacking such a formula, we cannot test the two series in Eq. (20) for convergence by direct methods.