[104r]

Ockham
Monday. 22nd Febʸ

Dear Mʳ De Morgan. The reply to one of
my queries to you, dispatched on Friday, has
I believe just occurred to me. Probably
this letter will cross one from you tonight,
but the remaining points continue still
unsolved, so that I shall be equally glad
if I do receive an answer tomorrow morning.
The difficulty I have solved is
the one relating to the law for the Co-efficients
of ['the series for' inserted] Δu_n. I remarked that the law for the
Co-efficients of the Series for u_n being
ascertained, did not ascertain those for Δu_n
as a necessary consequence. But I see I am
wrong. If a Series is obtained for u_n,
[104v–105r] we have only in order to obtain one for
Δu_n, to take the Difference of every term
['of the' crossed out] , (that is of the variable part of every
term), of the Series for u_n. Thus,

u_n being $= u + n\Delta u + n\frac{n-1}{2}\Delta^2 u + \cdots\cdot + n\frac{n_1}{2}\Delta^{n-2}u + n\Delta^{n-1}u + \Delta^n u$

Δu_n must $= \Delta u + \Delta(n\Delta u) + \Delta\left(n\frac{n-1}{2}\Delta^2 u\right) + \cdots + \Delta\left(n\frac{n-1}{2}\Delta^{n-2}u\right) + \Delta(n\Delta^{n-1}u) + \Delta(\Delta^n u)$

$= \Delta u + n\Delta^2 u + n\frac{n-1}{2}\Delta^3 u + \cdots + n\frac{n-1}{2}\Delta^{n-1}u + n\Delta^n u + \Delta^{n+1}u$

Whence &c, &c. I think this is quite sufficiently obvious. _
But I now have another query to put, in the place of the one I have just disposed
of, relating to the development in page 83,

$$\Delta u = amx^{m-1} + Ax^{m-2} + \cdots\cdot + Px + Q$$

and in which I cannot help thinking there is a mistake ['in the first Term' inserted]:_ I make
out that
it ought to be

$$\Delta u = am\omega x^{m-1} + Ax^{m-2} + \cdots$$

But I enclose my developments and observations therefore, on a longer & more
convenient sheet. I will only add here, that we move to Town on
Thursday; and that I should much like to spend Sunday Evening with
Mʳˢ De Morgan & you, if this arrangement is suitable & agreeable to you. I
[105v] should arrive as usual, about 8 o'clock
I believe I shall have by the end of this
week several papers ready to discuss. __
You see I do not waste my time, at
any rate; and I only hope that I am

not the means of wasting yours either.
Believe me

Yours very truly

A. A. Lovelace