[62r]
Ashley-Combe
10th Nov r

Dear Mr De Morgan. The last fortnight has been spent in total idleness, mathematically at least ; for we have had company & been as they say gadding about. __ I must set too [*sic*] now & work up arrears. _ But I have a batch of questions & remarks to send. __
First — on Peacock's Examples, which I have only now begun [62v] upon:
What does he mean by adding $d\,x$ to every solution? _ It appears to me a work of supererogation. _ I take the very first example in the book as an instance, and the same applies to all : _
Let $u = ax^3 + bx^2 + cx + e$:
it's [*sic*] differential, or $du =$
$= 3ax^2dx + 2bx\,dx + cdx$
or $(3ax^2 + 2bx + c)\,dx$.
I should have written, & in fact did write : it's [*sic*] differential or $du = 3ax^2 + 2bx + c$.
I suppose that this form [63r] is used under the supposition that x itself may be a function. ____
My result & the book's do not agree in one particular in the 9th example, page 2, & I am inclined to think it is a misprint in the latter : the Books says :
Let $u = x^2(a + x)^3(b - x)^4$
$du = \{2ab - (6a - 5b)x - 9x^2\}x(a + x)^2(b - x)^3dx$

and I say :
$du = \{2ab - (6a-5b)x - x^2\}x(a+x)^2(b-x)^3dx$
In case it may save you
trouble, I enclose my working
out of the whole. __
I do not the least understand
[63v] the note in page 2. Not
one of the three theorems it
contains is intelligible to me.
I conclude you to have
the Book by you ; but if
not I can copy out the
note & send it to you. __
Secondly — to go to your
Algebra : I think there is
an evident erratum page 225,
line 8 from the bottom, where
$1 + x + \frac{x-\frac{1}{n}}{2} + \frac{x-\frac{1}{n}}{2} \cdot \frac{x-\frac{2}{n}}{3} + \&c$
should certainly be
$1 + x + x\,\frac{x-\frac{1}{n}}{2} + x\,\frac{x-\frac{1}{n}}{2} \cdot \frac{x-\frac{2}{n}}{3} + \&c.$
I have a little difficulty
in page 226, the last line,
[64r] "let $\frac{1+b}{1-b} = \frac{1+x}{x}$ which gives $b =$
"$= \frac{1}{2x+1}$". —
In the first place I do not
feel satisfied that the form
$\frac{1+b}{1-b}$ is capable of being
changed into the form
$\frac{1+x}{x}$. There are three
suppositions we may make
upon it , (supposing that
it is capable of this second
form) . x may be less
than b, in which case
the denominator must also
be less than $1-b$, and less
in a certain given proportion,
in order that the Fractional
[64v] Expression may remain the
same . _ x may $= b$, in
which case the second form
can only be true on the

supposition that $1 - b = x =$
$= b$, or $b = \frac{1}{2}$. _
x may be <u>greater</u> than b,
in which case the denominator
of the second form must also
be <u>greater</u> than $1 - b$, in
a certain given proportion,
in order that the Fractional
expression may remain the
same. __
But secondly supposing $\frac{1+b}{1-b}$
to be under all circumstances
[65r] susceptible of the form $\frac{1+x}{x}$,
I cannot deduce from this
equation $b = \frac{1}{2x+1}$. ____
Your last letter, on
the Binomial Theorem, was
quite satisfactory to me, but
I have some remarks to make
on the s<u>econd</u> proof of it,
pages 211 to 213. I think
you <u>well</u> observe in the
note page 213, that the two
proofs supply each other's
deficiencies ; for I like neither
of them t<u>ake</u>n <u>singly</u>. __
The latter one is what I
should call rather cumbrous,
especially the verification of
$\varphi n \times \varphi m = \varphi(n + m)$ by
[65v] actual multiplication in page
212, which is an exceedingly
awkward & inconvenient
process in my opinion. __
Then I am not at all
sure that I like the
assumption in the last
paragraph of page 212. __
It seems to me somewhat
a large one , & much
more wanting of proof than
many things which in

Mathematics are rigorously &
scrupulously demonstrated.
But these inconsistencies
have always struck me
occasionally, and are perhaps
only in reality the inconsistencies
[66r] in a beginner's mind , &
which long experience &
practice are requisite to do
away with. __
The end of Euler's proof,
page 213, is not agreeable
to me, and for this reason,
that I cannot feel properly
satisfied as yet with the
little Chapter on Notation
of Functions, and upon the
full comprehension of this
depends the force of the
latter part of this proof. __
I do not know why it
is exactly , but I feel I
only half understand that
[66v] little Chapter X , and it has
already cost me more trouble
with less effect than most
things have . I must study
it a little more I suppose.
I hope soon I
may be able to return to
your Differential Calculus. _
At the same time , I never
more felt the importance of
not being in a hurry. _
I fancy great proficiency
in Mathematical Studies is
best attained by time ; __
constantly & continually doing
a little . _ If this is so,
surely then the University
[67r] cramming system must be
very prejudicial to a real

progress in the long run,
particularly when one considers
how very very little School-boys
are [‘generally’ inserted] prepared on first going
to the Universities, with
anything like distinct
mathematical or even
arithmetical notions of the
most elementary kind. __

I am now
puzzling over the Composition
of Ratios , but I hope in
a day or two more I shall
get successfully over that. __
It plagues me a good deal.
[67v] I believe I thought some
years ago, that I understood
it ; but I am inclined to
think I certainly never did.

You see just at
this moment I am full of
unsatisfactory obstacles ; but
I doubt not they will soon
yield . ____
With kindest remembrances to
M^{rs} De Morgan , I am

Yours very truly

A. A. L

I think there is an erratum
in your Trigonometry, page 34, line 7
from the top :
“let $NOM = \theta\odot$, $MOP = \varphi\odot$ &c”
should be . . . $\underline{\underline{N}}OP = \varphi\odot$ &c