[16r] My dear Lady Lovelace

You have taken a proper time to begin with Incommensurables and if the subject interests you, I should recommend you to continue. You understand of course that your Diff[l] Calculus must be delayed from time to time while you make up those points of Algebra and Trigonometry which you have left behind.

D. C. p. 53. As in page 22 refers to the method of proving that if $P = 2Q$, lim. of $P = 2$. lim. of Q

In similar way it may be shown that if

$\frac{\Delta u}{\Delta x} \cdot \frac{\Delta x}{\Delta u} = 1$ lim. of $\frac{\Delta u}{\Delta x} \times$ lim. of $\frac{\Delta x}{\Delta u} = 1$

With reference to your remark remember that

$\frac{\Delta u}{\Delta x} \cdot \frac{\Delta x}{\Delta u} = 1$ and $\frac{a}{b} \times \frac{b}{a} = 1$ <u>are</u> the same proposition

But $\frac{du}{dx} \times \frac{dx}{du} = 1$ and $\frac{a}{b} \times \frac{b}{a} = 1$ are <u>not</u> the same

---

$\frac{\Delta u}{\Delta x} \times \frac{\Delta x}{\Delta u} = 1$ by common algebra $\frac{a}{b} \times \frac{b}{a} = \frac{ab}{ab} = 1$

But we cannot say $\frac{du}{dx} \times \frac{dx}{du} = \frac{du\ dx}{dx\ du} = 1$

because $\frac{du}{dx}$ is a mere symbol to denote limit of $\frac{\Delta u}{\Delta x}$ and du and dx have no separate meaning

[16v] N. & M. p. 17

The erratum exists [‘but the misprint is’ crossed out] and must be set right as you propose

[‘for $\frac{q_1}{p_1} - \frac{q_2}{p_2}$,’ crossed out]

The lengthiness of the proof arises from the necessity of adapting a very common algebraical theory to Euclid’s method.

You should try some of the examples of differentiation in Peacock’s book. Remember that there are some misprints in it. You will not have to go <u>through</u> it to try a little of everything.

When the article <u>Proportion</u> appears in the Penny Cycl. which it will in a few weeks, I recommend your attention to it

With remembrances to Lord Lovelace I am

Yours truly

<u>ADeMorgan</u>

69 Gower St.

Sunday M[g] Sept[r] 27/40