Letter from Newton to John Collins, dated 16 July 1670

Author: Isaac Newton

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July 16th 1670.

Worthy Sir

I sometimes thought to have altered & enlarged Kinkhuysen his discourse upon surds but judging those examples I added would in some measure supply his defects I contented my selfe with doing that onely. But since you would have it more fully done, if the booke goe not immediately into the presse I desire you'le send it back with those notes I have made (since you are resolved to print them also) & I will doe something more to it or if you please to send all but the first sheete or two, while that is printing, Ile reveiw the rest & not only supply the wants about surds but that about Æquations soluble by trisection, & somthing more I would say in the chapter [Quomodò quæstio aliqua ad æquationem redigatur.] that being the most requisite & desirable doctrine to a Tyro & scarce touched upon by any writer unles in generall circumstances bidding them onely Nota ab ignotis non discernere & adhibere debitum ratiocionium.

As to Fergusons rendering the roots of Æquations soluble by trisection, his defect will appeare by example. Let us take his 2d $x^3 = 6x + 4$, in pag 12. In order to solve this hee bidds extract the cubick root of these binomiums $2 + \sqrt{-4}$, & $2 - \sqrt{-4}$ To doe this his rule pag 4 is: " Multiply the binomium by 1000, put in pure numbers &c: Now $2 + \sqrt{-4}$ in 1000 makes $2000 + \sqrt{-4000000}$, but to put this in pure numbers is impossible for $\sqrt{-4000000}$ is an impossible quantity & hath noe pure number answering to it. His rule therefore failes & The like difficulty is in his 3d example & in all other such cases. In generall I see not what hee hath done more then in Cardans rules. For in this instance Cardans rule will give you $x =$ $= \sqrt{\ }\text{c: } \overline{2 + \sqrt{-4}} + \sqrt{\ }\text{c: } \overline{2 - \sqrt{-4}}$. in which the only difficulty as before is to extract the rootes of the binomiums $2 + \sqrt{-4}$ & $2 - \sqrt{-4}$. Which roots indeed are $-1 + \sqrt{-1}$ & $-1 - \sqrt{-1}$, as he assignes them, but tells not how to extract them. Nor doe I see what hee hath done more then Descartes in his Solution of biquadratick Equations: for both goe the same way to worke in reducing them first to Cubick & then to quadratick æquation. Lastly I see not in what case his rules will render the roots of cubick or biquadratick Æquations in proprio genere where those of Cardan or Descartes will not. But in hast I must take my leave remaining

Your most obliged servant

I. Newton

< insertion from lower down the page >

I thank you for your two last bookes.

< text from f 8r resumes >
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Mr Newton about Fergusons Booke

These

To Mr John Collins at
his house neare the three Crownes
in Bloomsbury in

London.

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