AN INTRODUCTION TO THE DOCTRINE OF FLUXIONS

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JOHN ROWE

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INTRODUCTION

TO THE

DOCTRINE

OF

FLUXIONS.

By JOHN ROWE.

The SECOND EDITION,
With ADDITIONS and ALTERATIONS.

TO

WILLIAM DAVY Esq;

SERJEANT at LAW,

THIS

TRACT

IS INSCRIBED,

BY

His most Obedient

Humble Servant,

The AUTHOR.

THE

PREFACE.

OF all the Mathematical Sciences, the *Doctrine of Fluxions* is the most extensive and sublime. By this, many Difficulties, unsurmountable by any other known Method, are solved with uncommon Expedition, Elegance, and Ease.

THE Lengths of curve Lines, the Areas of plane curvilineal Spaces, and the Surfaces and Solidities of convex Bodies; though in some few Figures they may be determined

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by *the Ancients* Method of Exhauſtions, *Cavalerius*'s Geometry of Indiviſibles, or Dr. *Wallis*'s Arithmetic of Infinites *; yet, the Fluxional Method is the only one by which they can be obtained in General.

FLUXIONS are likewiſe a General Method for determining the Maxima and Minima of Quantities; drawing Tangents to Curves, finding their Points of Inflection, and the Radii of Curvature.   By this Method alſo, are derived Theorems for calculating of Sines, Tangents, and Secants; and for making Logarithms of any Form whatever. Nor is it confined here; but extends to the inveſti-gating a great Variety, not only of other Mathematical, but alſo of Philoſophical Pro-blems,

THE *Method of Fluxions* was firſt invented about the Year 1665, by that Prince of Mathematicians and Philoſophers the late Sir *Iſaac Newton*, then Mr. *Newton* about 23 Years old: But, as he gave no public Speci-

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* The *Geometry of Indiviſibles*, was firſt printed in the Year 1635; and the *Arithmetic of Infinites*, in the Year 1656.

Specimens thereof till the Appearance of his excellent *Principia* in the Year 1687, the celebrated *German* Mr. *Godfrey William Leibnitz*, to whom it was communicated in the Year 1676, applied it in the *Acta Eruditorum* printed at *Leipfic* in 1684, to a few Maxima and Minima, and Tangents to Curves, and therein claimed the Invention himfelf.——Their *Notations* indeed are different.*; and, as Quantities are, by both, in Effect, confidered as produced by continual Increafe, after the fame Manner as Space is defcribed by a Body in Motion, inftead of the *Velocity* with which a Quantity flows at any Point or Term of the Time in which it is fuppofed to be generated, called by Sir *Ifaac* a *Fluxion, Leibnitz* takes the *Increment*, or little Part generated in an indefinitely fmall Portion of Time, and calls it a *Differential*.——But, as entering farther into the Controverfy is foreign to my Defign, thofe

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* *Leibnitz* denotes the *Differential* of any variable Quantity *x*, by *dx*; its *Second Differential*, by *ddx*. And Sir *Ifaac*, for its *Fluxion*, writes $\dot{x}$; for its *Second Fluxion*, $\ddot{x}$: but in his *Principia*, flowing Quantities are expreffed by the capital Letters X, Y, Z, and their *Fluxions* by the fmall Letters *x, y, z*, refpectively.

who are inclined to fee more thereof, I muft refer to the *Commercium Epiftolicum*, publifhed by Order of the *Royal Society*, or to Mr. *Raphfon's Hiftory of Fluxions*; wherein, Sir *Ifaac* is fully proved, the Original Inventor of this noble and moft extenfive Method.

SEVERAL excellent Treatifes have been wrote on the Subject; but, as they appear not calculated to introduce the young Beginner into this abftrufe and difficult Science; fo, in Order to his underftanding them, a plain and eafy *Introduction* feems to be Neceffary: And for that End, the *Firft Impreffion* of the following Tract, publifhed in the Year 1751, was wholly defigned.

IN this *fecond Edition*, I have made many confiderable *Alterations* and *Additions*; by which it is rendered much more plain, full, and correct than the former.———It is divided into *Two Parts*: The *Firft* treats of the *Direct Method of Fluxions*; in which, from the generated Quantity or *Fluent* being given, we find the *Fluxion*: And the *Second*, of the *Inverfe Method*; wherein, from the *Fluxion* being

being known, we find the *Fluent* *. And, at the End, is added, an *Appendix*, containing mifcellaneous Queftions with their Anfwers; which could not well be inferted with the Examples for Illuftration, and to fome of which there was Occafion to refer.

THOSE Things in the former Edition occafioned by Hints communicated by an ingenious and learned Friend, are in this fecond ftill retained; but, thofe Others in which another Hand was concerned, are here omitted.

IN Order to a thorough Underftanding of this *Introduction*, it is requifite that the Learner be well acquainted with Arithmetic, Algebra, Geometry, Plane-Trigonometry, Conic-Sections, and the Nature of Logarithms. But, fince many geometrical and algebraical Treatifes, give not the Defcriptions, and from thence the Deduction of the Properties, of fome Curves to be found in

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* The *Direct Method of Fluxions*, as delivered by *Leibnitz*, is, by Foreigners, called *Calculus Differentialis*; and the *Inverfe Method*, *Calculus Integralis*.