7. Find the expressions for the radius of curvature in any curve, and thence the radius of curvature in the curve $y=e^x$.

8. Prove Taylor's Theorem, and apply it to find cosin x in terms of the arc.

FOURTH PAPER. (Newton.)

1. If h be twice the area passed over by the radius vector in 1″, prove $F=\frac{2h^2QR}{QT^2\,SP^2}=\frac{2h^2QR}{PQ^2\,SY^2}$

2. Find the value of F in an Ellipse, the force tending to the centre.

3. Find F in an Ellipse, the force tending to a focus.

4. Find F tending to the focus in a Parabola.

5. If different bodies revolve in Elliptical orbits round a common centre of force, the force varying as $\frac{1}{D^2}$, prove that the squares of the periodic times are as the cubes of the mean distances.

6. Having given 1 : 390, the ratio of the moon's distance from the earth to the earth's distance from the sun, and $365\frac{1}{4}$: $27\frac{1}{3}$, the ratio of the periodic times of the Earth and Moon, prove, that the ratio of the mean force acting on the Earth to that on the Moon is 2.17 nearly.

7. When is the paracentric velocity a maximum? In what point of the Conic sections is it so? Does it admit of a maximum in a circle, the centre of force being in the circumference, and, if so, what is its amount?

8. Determine the point in an Ellipse, the force being in the focus, in which the velocity is a geometric mean between the velocities at the greatest and least distances.

9. If a body move in an orbit by a force, tending to a centre and varying as $\frac{1}{D^2}$, prove that it will describe a conic section, and point out the conditions of velocity on which it depends whether a Cometary orbit be an Ellipse, a Parabola, or a Hyperbola.