4. Inverse Funcnoivre's Theorem larks, March, 200.

Chapters I to earts. § 68, 69. earks, March, 200.

apter I to III.

pally geometrigent compared; and other conics.

axis and focal ular from the o the point of e at the focus. perpendicular

 $\frac{1}{2\theta}; r = a + x.$ ores is double
Sub-tangent

normal = 2p; the constants ee parameters holee of axes: $4a (x - x^1)$ imilarly for simple equad their prongents from conal to the of the equant, together gent are bi-

the tangent

g straight and direcTo draw a parabola, given its vertex, axis and thence to draw it, given the axis and two points distances from the axis.

Intersections of Conics, straight lines and other ntact. Circle of curvature; 2ρ as limit of $\frac{y^2}{x}$ or $\frac{y^2}{x}$ sin $\frac{y^2}{y^2}$

 $\therefore \rho = \frac{2a}{\sin^3 \theta} = \frac{N}{\sin^2 \theta} = \frac{N^3}{SL^2}; \text{ thence construction of radius}$ of curvature, and evolute.

Intersection of circle and conic, equal inclinations of opposite chords; thence construction of radius of curvature, § 208.

Ellipse.—Chapter IX, X, omitting 8 205.

Ellipse.—Chapter IX, X, omitting § 205. Equation found from the definitions of an ellipse as the projection of a circle, as described by the trammel, and as r+r'=2a, instead of that given in Todhunter. Geometric properties proved from the definition $r+r^1=2a$, as follows: Construction of a tangent; its equal inclinations to the focal distances; locus of the foot of the perpendicular from the focus. $pp'=b^2$; $\frac{p}{p'}=\frac{r}{r'}$; $p^2=\frac{b^2}{r'}$.

 $pp - b^2$; p' = r'; $p^2 = r'$. Equations to tangent and normal. Points where the tan-

gent cuts the axes.

Locus of intersection of tangent with the perpendicular at the focus to the radius vector; locus of intersection of tangents at the extremities of a focal chord; proof of Todhunter's definition of an ellipse; the straight lines ae, a_e ; $r=a\pm ex$.

Polar equation referred to both focus and centre. The level of the straight lines are a second centre.

Polar equation referred to both focus and centre: The length e^2x' both analytically and geometrically.

Equation at the vertex becomes a parabola if e=1 or $a=\infty$. Latus rectum $=2\frac{b^2}{a}=2e\binom{a}{e}-ae$, compared with parabola. e is the tangent of the inclination of the tangent from the foot of the directrix. Other properties compared with the parabola. Relation $p^2=a^2\cos^2\alpha+b^2\sin^2\alpha$ for perpendicular from centre on tangent; thence locus of intersection of perpendicular tangents.

The eccentric angle; $x = a \cos \theta$; $y = b \sin \theta$. Locus of a point obtained by measuring $\frac{a+b}{2}$ at an inclination θ and then $\pm \frac{a-b}{2}$ at $-\theta$

Diameters investigated analytically as for parabola (alternative with § 187.) Conjugate diameters as the projections of two perpendicular diameters of the auxiliary circle; hence the