163. If

$$\left.\begin{aligned} cx + by - lxy = 0 \\ ay + cz - myz = 0 \\ bz + ax - nzx = 0 \end{aligned}\right\},$$

then $l^2acx + m^2bay + n^2cbz = 0$, where l, m, n are the roots of the equation $f^3 + g = 0$.

164. If n be a positive integer, shew that

$$\frac{\lfloor n+1}{\lfloor n-1}+\frac{\lfloor n}{\lfloor n-2}+\frac{\lfloor n-1}{\lfloor n-3}+\ldots\ldots+\frac{\lfloor 4}{\lfloor 2}+\frac{\lfloor 3}{\lfloor 1}+\frac{\lfloor 2}{\lfloor 0}$$

is to $1^2+2^2+3^2+\ldots\ldots+n^2$ as $2(n+2)$ is to $(2n+1)$; and that the series

$$\frac{\lfloor 0}{\lfloor 2}+\frac{\lfloor 1}{\lfloor 3}+\frac{\lfloor 2}{\lfloor 4}+\ldots\ldots+\frac{\lfloor n-3}{\lfloor n-1}+\frac{\lfloor n-2}{\lfloor n}+\frac{\lfloor n-1}{\lfloor n+1}$$

$$=\frac{4}{n(n+1)^3}[1^3+2^3+3^3+\ldots\ldots+n^3].$$

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MATHEMATICAL TRIPOS.

13. From any point P on a given circle tangents PQ, PQ' are drawn to a second circle whose centre is on the circumference of the first; shew that the chord joining the points where these tangents cut the first circle is fixed in direction and intersects QQ' on the line of centres.

14. Any chord PQ of a parabola cuts the axis in O; shew that

$$PQ^2 = AP^2 + AQ^2 + 2RO^2 - 2AO^2,$$

A being the vertex of the parabola, and RO the ordinate through O.

15. A chord PP' of a hyperbola cuts the asymptotes in R, R'; CTV is the diameter bisecting the chord, and T the intersection of tangents at its extremities; prove that the parallelogram described with TV as diagonal and its sides parallel to the asymptotes, has its other corners on the curve and its other diagonal parallel to PP' and a third proportional to RV and PV.

16. If
$$\left.\begin{aligned} a^2x^2 + b^2y^2 + c^2z^2 = 0, \\ a^3x^3 + b^3y^3 + c^3z^3 = 0, \end{aligned}\right\}$$
and
$$\left.\frac{1}{x} - a^2 = \frac{1}{y} - b^2 = \frac{1}{z} - c^2,\right\}$$
prove that $a^4x^3 + b^4y^3 + c^4z^3 = 0$,
and $a^6x^3 + b^6y^3 + c^6z^3 = a^4x^2 + b^4y^2 + c^4z^2$.

17. If a_1, $a_2 \ldots a_n$ be n real quantities and $(a_1^2 + a_2^2 + \ldots + a_{n-1}^2)(a_2^2 + a_3^2 + \ldots + a_n^2)$ be equal to $(a_1a_2 + a_2a_3 + \ldots + a_{n-1}a_n)^2$, then a_1, $a_2 \ldots a_n$ are in geometrical progression.

18. If A, B, C are the angles of a triangle $\cos A + \cos B + \cos C$ is greater than 1 and not greater than $\frac{3}{2}$.

19. If P be the orthocentre of a triangle ABC, PA, PB, PC are the roots of the equation

$$x^3 - 2(R+r)x^2 + (r^2 - 4R^2 + s^2)x - 2R\{s^2 - (r+2R)^2\} = 0,$$

where R and r are respectively the radii of the circumscribed and inscribed circles and s is the semi-perimeter.

20. It is impossible to construct a triangle out of the perpendiculars from the angles of a triangle on the sides if any side is $< \frac{3-\sqrt{5}}{4} \times$ perimeter: and it is certainly possible to construct such a triangle if each side is $> \frac{1}{3}$ perimeter.

THE Official Minutes of the Ontario Teachers' Association are expected to be ready for circulation in a short time. Of late years they have not appeared until they had become stale.

WE are paying at present about £91,000 for the School Board of Education of Glasgow, and probably in two years more the amount will fall not far short of £100,000 annually.—*Glasgow Herald.*