107. On the necessary conditions for the Fermat's last theorem.

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Concerning the Fermat's last theorem Prof. Vandiver has proved: if

$$x^p+y^p+z^p=0\,, \qquad p\nmid xyz\,,$$

then the following condition

$$\frac{1}{1^2}+\frac{1}{2^2}+\cdots\cdots+\frac{1}{\left[\frac{p}{3}\right]^2}\equiv 0 \pmod p\,,$$

is necessary[1].

In the present paper I will give a proof of H. Schwandt's condition[2]

$$\frac{1}{1^2}+\frac{1}{2^2}+\cdots\cdots+\frac{1}{\left[\frac{p}{6}\right]^2}\equiv 0 \pmod p \qquad (\mathrm{I})$$

and then show that two analogous conditions

$$\frac{1}{1}+\frac{1}{2}+\cdots\cdots+\frac{1}{\left[\frac{p}{3}\right]}\equiv 0 \pmod p \qquad (\mathrm{II})$$

and

$$\frac{1}{1}+\frac{1}{2}+\cdots\cdots+\frac{1}{\left[\frac{p}{6}\right]}\equiv 0 \pmod p \qquad (\mathrm{III})$$

are necessary.

§ 1. Proof of (I).

We put

$$a_1=\frac{1}{1^2}+\frac{1}{2^2}+\cdots\cdots+\frac{1}{\left[\frac{p}{3}\right]^2}\,,$$

$$a_2=\frac{1}{1^2}+\frac{1}{2^2}+\cdots\cdots+\frac{1}{\left[\frac{p}{2}\right]^2}\,,$$

1) Vandiver: Annals of Math. **26** (1924).
2) Schwandt: Jahresber. d.D.M.V. **43** (1934).