# Report for Smith's proof of Fermat's Last Theorem

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In page 2, from equations 7-10, Smith implicitly assumes that both $z_{y+1,k}$ and $z_{y,k+1}$ are both in $\mathbb{Z}$. In order to reach the conclusion $\alpha = \beta$, he assumes $z_{k,y}+\alpha, z_{k,y}+\beta \in \mathbb{Z}$. Thus, what Smith has proved is that there are no solutions to the system

$$(y+1)^n + k^n = x^n$$
$$y^n + (k+1)^n = x^n$$

.

Moreover, the implication of $\alpha = \beta$ is absurd. If the assumption holds, $z_{y+1,k} = z_{y,k}$. Note that $z_{y+1,k} \neq z_{y,k}$. This can verified by computing $z$ directly. We have an explicit formula for $z_{y,k}$.

$$z_{y,k} = \sqrt[n]{y^n + k^n}$$

Compare $z_{10,4}$ and $z_{11,4}$ for $n = 5$

$$\left(10^5 + 4^5\right)^{\frac{1}{5}} = 10.0203966257$$

$$\left(11^5 + 4^5\right)^{\frac{1}{5}} = 11.0139526748$$

And clearly the two values do not match.

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