was astonished to learn that the Pell equation $x^2 - Dy^2 = 1$ had
been solved as early as 3000 years ago in India. The fundamental
solution of $x^2 - 8y^2 - 1$ is $9 - 8 \cdot 1 = 1$. For $D = 13$, the
fundamental solution is $421201 - 13 \cdot 32400 = 1$. Since this
solution appears in an ancient writing, an algorithm was known in
prehistoric times.

In modern times, the idea of finding solutions in positive in-
tegers has been extended. For all sorts of polynomial and expo-
nential equations, one looks for solutions in (some fixed) number
field. It is believed that the only solution of $3^x - 2^y = 1$ is given
by $9 - 8 = 1$, but I know no proof. If $a, b, c > 1$, the equa-
tion $a^x - b^y = c^z$ $(x, y, z > 2)$ probably has only finitely many
solutions. The famous Fermat equation is a special case. It is
conjectured to have no solutions.

The Thue equation is $f(x, y) = k$, $k > 0$. Here $f(x, y)$ is a
homogeneous polynomial in x, y with (say) integer coefficients.
Shorey and Tijdeman proved that each such equation has only
finitely many solutions. De Weger gives an algorithm for finding
all solutions. For reasonably small values of k the algorithm is
practicable with current technology.

Another problem is: solve $x + y = z^2$, where the prime divisors
of xy are restricted to be among $2, 3, 5, 7$. De Weger tabulates
all solutions. The largest is $2^3 3^7 5^4 7 + 1 = 13^2 673^2$. Other large
ones are $2^{12} + 3^3 \cdot 5 \cdot 7 = 71^2$, $2^5 3^2 5^2 7 + 1 = 449^2$. The smallest
are $3 + 1 = 4$, $2 + 2 = 4$.

<div style="text-align: right">

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Volterra integral and functional equations, by G. Gripenberg, S.-O.
   Londen, and O. Staffans. Cambridge University Press, Cam-
   bridge, 1990, 701 pp., $99.50. ISBN 0-521-37289-5

The spirit of this book is captured in the following quotation
from the introduction "The subject of Volterra equations in finite