The Universe of Discourse

A message to the aliens, part 4/23 (algebra)

This is page 4 of the *Cosmic Call* message. An explanation follows.
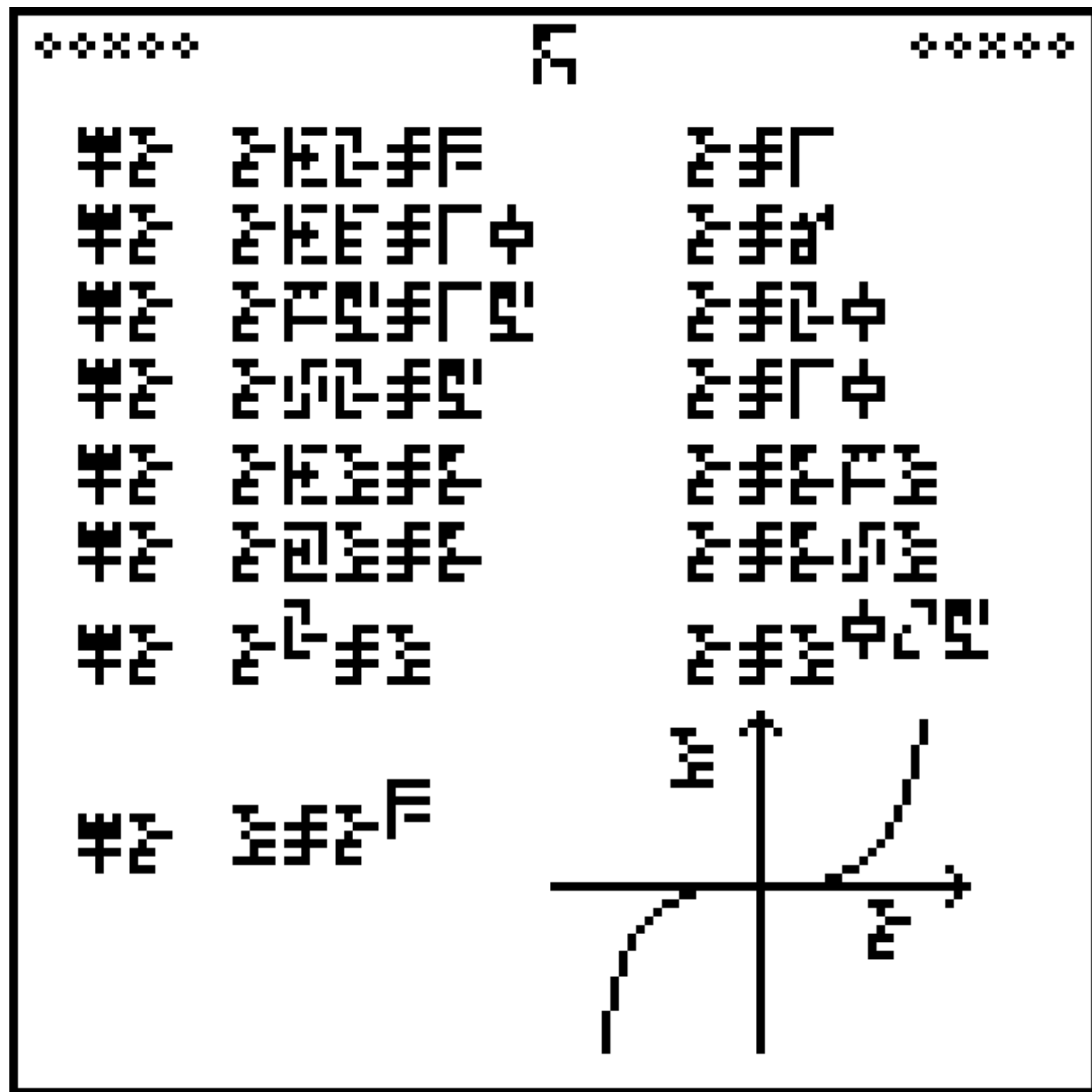
Reminder: [page 1](BLOGREF/aliens/dd/p01.html) explained the ten digits:

And the equal sign ⧉. [Page 2](BLOGREF/aliens/dd/p02.html) explained the four basic arithmetic operations and some associated notions:

addition subtraction multiplication division negation ellipsis (…) decimal indeterminate
point

This page, headed with the glyph for "mathematics" , describes the solution of simple algebraic equations and defines glyphs for three variables, which we may as well call x, y, and z:

x   y   z

Each equation is introduced by the locution which means "solve for x". This somewhat peculiar "solve" glyph will not appear again until page 23.

For example the second equation is $x + 4 = 10$:

Solve for x: $x + 4 = 10$

The solution, 6, is given over on the right:

$x = 6$

After the fourth line, the equations to be solved change from simple numerical equations in one variable to more abstract algebraic relations between three variables. For example, if

Solve for x: $x \cdot y = z$

then

$x = z \div y.$

The next-to-last line uses a decimal fraction in the exponent, 0.5: . On the previous page, the rational fraction $1 \div 2$ was used. Had the same style been followed, it would have looked like this:

.

Finally, the last line defines $x = y^3$ and then, instead of an algebraic solution, gives a graph of the resulting relation, with axes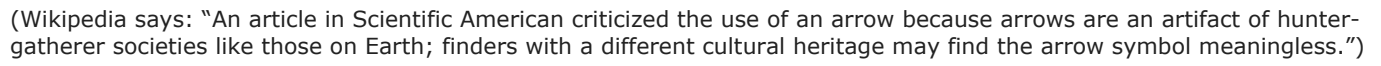 labeled. The scale on the axes is not the same; the x-coordinate increases from 0 to 20 pixels, but the y-coordinate increases from 0 to 8000 pixels because $20^3 = 8000$. If axes were to the same scale, the curve would go up by 8,000 pixels. Notice that the curve does not peek above the x-axis until around $x = 8, y = 512$ or so. The authors could have stated that this was the graph of $y = x^3 \div 400$, but chose not to.
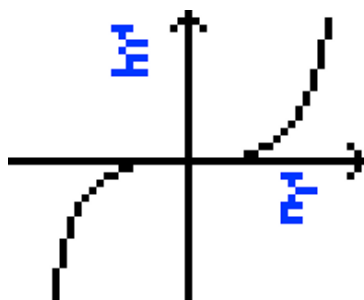
I also wonder what the aliens will make of the arrows on the axes. I think the authors want to show that our coordinates increase going up and to the left, but this seems like a strange and opaque way to do that. A better choice would have been to use a function with an asymmetric graph, such as $y = 2^x$.

(After I wrote that I learned that similar concerns were voiced about the use of a directional arrow in the Pioneer plaque.

(Wikipedia says: "An article in Scientific American criticized the use of an arrow because arrows are an artifact of hunter-gatherer societies like those on Earth; finders with a different cultural heritage may find the arrow symbol meaningless.")

The next article will discuss page 5, shown at right. (Click to enlarge.) Try to figure it out before then.