### T137803 – 2-07-19 test results

Using: CX2 wm 16 on Firefox, English to Português, on test.wikipedia.org

<table>
<thead>
<tr>
<th>Page</th>
<th>Google Translate</th>
<th>Yandex</th>
<th>Copy Original Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Funções ortogonais Orthogonal Functions</td>
<td>Replaces math with: <code>&lt;/img&gt; ✓</code></td>
<td>Renders correctly, with ONE exception (see Note 1 below)</td>
<td>Renders correctly.</td>
</tr>
<tr>
<td>Função de Conway em base 13 Conway Base 13 Function</td>
<td>Replaces math with: <code>&lt;/img&gt; ✓</code></td>
<td>Renders correctly, again with ONE exception (see Note 2)</td>
<td>Renders correctly, with ONE exception (same paragraph as Yandex)</td>
</tr>
<tr>
<td>Problema booleano dos trios pitagóricos Boolean Pythagorean triples problem</td>
<td>Replaces math with: <code>&lt;/img&gt; ✓</code> However, the math theorem template renders correctly.</td>
<td>Renders correctly</td>
<td>Renders correctly</td>
</tr>
<tr>
<td>Código binário de Golay Binary Golay code</td>
<td>Replaces math with: <code>&lt;/img&gt; ✓</code></td>
<td>Renders correctly</td>
<td>Renders correctly</td>
</tr>
<tr>
<td>Menor (álgebra linear) Minor (linear algebra)</td>
<td>Replaces math with: <code>&lt;/img&gt; ✓</code> In one case renders the math formula, but follows it with a duplicate and <code>&lt;/img&gt; ✓</code> (See Note 4 below.)</td>
<td>Renders correctly</td>
<td>Omits a number of math elements, while rendering others (See Note 3.)</td>
</tr>
<tr>
<td>Teoria de Picard–Vessiot Picard-Vessiot Theory</td>
<td>No <code>&lt;math&gt;</code> elements to test on this page.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grupo solúvel Solvable group</td>
<td>Replaces math with: <code>&lt;/img&gt; ✓</code></td>
<td>Renders correctly</td>
<td>Renders correctly</td>
</tr>
<tr>
<td>Transformação linear direta Direct Linear Transformation</td>
<td>Replaces math with: <code>&lt;/img&gt; ✓</code></td>
<td>Renders mostly correctly, but in one case omits several math elements. (See Note 5.)</td>
<td>Renders correctly</td>
</tr>
<tr>
<td>Critério de Eisenstein Eisenstein’s Criterion</td>
<td>Replaces math with: <code>&lt;/img&gt; ✓</code> where <code>&lt;math&gt;</code> tags are used. Correctly renders elements inserted with `{{math</td>
<td>...}}`</td>
<td>Renders correctly</td>
</tr>
<tr>
<td>Conjectura de Beal Beal Conjecture</td>
<td>Replaces math with: <code>&lt;/img&gt; ✓</code></td>
<td>Renders block-level math elements correctly. Fails to render some inline elements. See note 7.</td>
<td>Renders correctly</td>
</tr>
</tbody>
</table>
Notes:

1) On page “Orthogonal Functions” (English to Portugues via Yandex), all inline and block level math elements were rendered correctly except for this paragraph, in which two inline math elements were not displayed (although a third was):

Suppose \( \{f_0, f_1, \ldots\} \) is a sequence of orthogonal functions of nonzero \( L^2 \)-norms.

\[
\|f_n\|_2 = \sqrt{\langle f_n, f_n \rangle} = \left( \int f_n^2 \, dx \right)^{\frac{1}{2}}
\]

It follows that the sequence \( \{f_n/\|f_n\|_2\} \) is a sequence of \( L^2 \)-norm one, forming an orthonormal sequence. To have a defined \( L^2 \)-norm, the integral must be bounded, which restricts the functions to being square-integrable.

Elsewhere on the page, Yandex handled similarly complex elements without a problem:

For Laguerre polynomials on \((0, \infty)\), the weight function is \(w(x) = e^{-x} \).

Both physicists and probabilists use Hermite polynomials on \((-\infty, \infty)\), where the weight function is \(w(x) = e^{-x^2}\) or

Chebyshev polynomials are defined on \([-1, 1]\) and use weights \(w(x) = \frac{1}{\sqrt{1-x^2}}\) or \(w(x) = \sqrt{1-x^2}\).

2) On page “Conway Base 13 Function” (translated via Yandex), this paragraph omits all math elements except the last. (Every other paragraph on the page rendered correctly.)

To prove this, let \( c \in (a, b) \) and \( r \) be any real number. Then \( c \) can have the tail end of its tridecimal representation modified to be either \( A_{13} \) or \( B_{13} \) depending on the sign of \( r \), replacing the decimal dot with a \( C \), giving a new number \( c' \).

By introducing this modification sufficiently far along the tridecimal representation of \( c \), the new number \( c' \) will still lie in the interval \((a, b)\) and will satisfy \( f(c') = r \).

Note that the Copy Original Content option ALSO has trouble with this paragraph (though a different mix of math elements are omitted):
To prove this, let \( c \in (a, b) \) and \( r \) be any real number. Then \( c \) can have the tail end of its tridecimal representation modified to be either \( A\hat{r} \) or \( B\hat{r} \) depending on the sign of \( r \) (replacing the decimal dot with a \( C' \)), giving a new number \( c' \). By introducing this modification sufficiently far along the tridecimal representation of \( c \), the new number \( c' \) will still lie in the interval \( (a, b) \) and will satisfy \( f(c') = r \).

Important: With both Yandex and Copy Original Content, the FIRST time I clicked to translate the paragraph, for a fraction of a second it was displayed with all math elements rendered before reverting to the partial rendering shown above.

3) On page “Minor (linear algebra)”, Copy Original Content omits a number of math elements while correctly rendering others.

**General definition**

Let \( A \) be an \( m \times n \) matrix and \( k \) an integer with \( 0 < k \leq m \), and \( k \leq n \). \( A \times k \times k \) minor of \( A \), also called minor determinant of order \( k \) of \( A \) or, if \( m = n \), \((n-k):th\) minor determinant of \( A \), with the word “determinant” often omitted and the word “order” sometimes replaced by “degree”, is the determinant of a \( k \times k \) matrix obtained from \( A \) by deleting \( m - k \) rows and \( n - k \) columns.

Sometimes the term is used to refer to the \( k \times k \) matrix obtained from \( A \) as above (by deleting \( m - k \) rows and \( n - k \) columns), but this matrix should be referred to as a **(square) submatrix** of \( A \), leaving the term “minor” to refer to the determinant of this matrix. For a matrix \( A \) as above, there are a total of \( \binom{m}{k} \cdot \binom{n}{k} \) minors of size \( k \times k \). **Minor of order zero** is often defined to be 1. For a square matrix, **zeroth minor** is just the determinant of the matrix.[2][3]

Let \( 1 \leq i_1 < i_2 < \ldots < i_k \leq m \), \( 1 \leq j_1 < j_2 < \ldots < j_k \leq n \) be ordered sequences (in natural order, as it is always assumed when talking about minors unless otherwise stated) of indexes, call them \( I \) and \( J \), respectively. The minor \( \det \left( A_{i_p,j_q} \right)_{p,q=1,\ldots,k} \) corresponding to these choices of indexes is denoted \( \det_{I,J} A \) or \( \left[ A \right]_{I,J} \) or \( M_{I,J} \) or \( M_{i_1,i_2,\ldots,i_k,j_1,j_2,\ldots,j_k} \) (where the \( (i) \) denotes the sequence of indexes \( I \), etc.).

Let \( 1 \leq i_1 < i_2 < \ldots < i_k \leq m \), \( 1 \leq j_1 < j_2 < \ldots < j_k \leq n \) be ordered sequences (in natural order, as it is always assumed when talking about minors unless otherwise stated) of indexes, call them \( I \) and \( J \), respectively. The minor corresponding to these choices of indexes is denoted \( \det_{I,J} A \) or \( \left[ A \right]_{I,J} \) or \( M_{I,J} \) or \( M_{i_1,i_2,\ldots,i_k,j_1,j_2,\ldots,j_k} \) (where the \( (i) \) denotes the sequence of indexes \( I \), etc.), depending on the source. Also, there are two types of denotations in use in literature: by the minor associated to ordered sequences of
4) On page “Minor (linear algebra), Google Translate replaces most math elements with \(<img>\) but in one case it renders the math element, duplicates it, and follows it up with the usual \(<img>\):

The above formula can be generalized as follows:
Let \(1 \leq i_1 < i_2 \ldots < i_k \leq n\), \(1 \leq j_1 < j_2 \ldots < j_k \leq n\) be ordered sequences (in natural order) of indexes (here \(A\) is an \(n \times n\) matrix). Then [citation needed]

A fórmula acima pode ser generalizada da seguinte forma:
For \(1 \leq i_1 < i_2 \ldots < i_k \leq n\), \(1 \leq j_1 < j_2 \ldots < j_k \leq n\) be ordered sequences (in natural order) of indexes (here \(A\) is an \(n \times n\) matrix). Then

5) On page “Direct Linear Transformation” (translated via Yandex), this paragraph omits many math elements. As with Note 2, the FIRST time I clicked to translate the paragraph, for a fraction of a second it was displayed with all math elements rendered before reverting to the partial rendering shown here:

where \(A\) now is Each \(k\) provides one equation in the \(2q\) unknown elements of \(A\) and together these equations can be written \(B\ a = 0\) for the known \(N \times 2q\) matrix \(B\) and unknown \(2q\)-dimensional vector. This vector can be found in a similar way as before.

onde \(A\) agora é Cada \(k\) fornece uma equação dos \(2q\) elementos desconhecidos de e juntas, essas equações podem ser escritas para o conhecido \(B\) -matriz e desconhecido \(2t\) -dimensional vetor. Este vetor pode ser encontrado em uma maneira similar como anterior.

Also – In line 4, note the \(2q\) that is translated as \(2t\).

6) On page “Eisenstein’s Criterion” (translated via Copy Original Content), math elements inserted with \(<math>\) tags are rendered correctly, but those inserted with \(<math>\) are often omitted.

This formulation already incorporates a shift to \(a\) in place of \(0\), the condition on \(F(x)\) means that \(F(a)\) is not divisible by \(p\) and so \(pF(a)\) is divisible by \(p\) but not by \(p^2\). As stated it is not entirely correct in that it makes no assumptions on the degree of the polynomial \(F(x)\), so that the polynomial considered need not be of the degree \(n\) that its expression suggests; the example \(\left(x^2 + px + 1 \right) \equiv \left(x^2 + p \left(ax + 1 \right) \text{ mod } p^2\right)\) shows the conclusion is not valid without such hypothesis. Assuming that the degree of \(F(x)\) does not exceed \(n\), the criterion is correct however, and somewhat stronger than the formulation given above, since if \((x - a)^n + pF(x)\) is irreducible modulo \(p^2\), it certainly cannot decompose in \(\mathbb{Z}[x]\) into non-constant factors.
This formulation already incorporates a shift to \( \text{mvar}[a] \) in place of \( \text{math}[0] \); the condition on \( \text{math}['F'(x')] \) means that \( \text{math}['F'(a')] \) is not divisible by \( \text{mvar}[p] \), and so \( \text{math}['F'(a')] \) is divisible by \( \text{mvar}[p] \) but not by \( \text{math}['F'(a')] \). As stated it is not entirely correct in that it makes no assumptions on the degree of the polynomial \( \text{math}['F'(x')] \), so that the polynomial considered need not be of the degree \( \text{mvar}[n] \) that its expression suggests; the example \( \text{math}['F' + 1] = \text{math}['F(x) + 1] \mod p \), shows the conclusion is not valid without such hypothesis.

Assuming that the degree of \( \text{math}['F'(x')] \) does not exceed \( \text{mvar}[m] \), the criterion is correct however, and somewhat stronger than the formulation given above, since if \( \text{math}['F'(x')] \) is irreducible modulo

\( \text{math}['F'(x')] \), it certainly cannot decompose into non-constant factors.

7) On page “Beal Conjecture” (translated via Yandex), all block-level math elements are rendered correctly, but some inline elements are not rendered.

**Related examples**

To illustrate, the solution \( 3^3 + 6^3 = 3^5 \) has bases with a common factor of 3, the solution \( 7^3 + 7^4 = 14^{13} \) has bases with a common factor of 7, and \( 2^n + 2^n = 2^{n+1} \) has bases with a common factor of 2. Indeed the equation has infinitely many solutions where the bases share a common factor, including generalizations of the above three examples, respectively.

For illustration, the solution has bases with a common factor of 3, a solution has bases with a common factor of 7, and \( 2^n + 2^n = 2^{n+1} \) has bases with a common factor of 2. Indeed, the equation has infinitely many solutions where the bases share a common factor, including generalizations of the above three examples, respectively.