MathML in Browsers

Web Engines Hackfest - October, 2019

$$\Gamma(t) = \int_0^{+\infty} x^{t-1} e^{-x} dx = \frac{1}{t} \prod_{n=1}^{\infty} \frac{\left(1+\frac{1}{n}\right)^t}{1+\frac{t}{n}} \sim \sqrt{\frac{2\pi}{t}} \left(\frac{t}{e}\right)^t$$

Rob Buis (`rbuis@`)

Frédéric Wang (`fwang@`)

(I) HISTORY

1977-1984 **Math typesetting rules**	$\TeX$ typesetting system	The $\TeX$book
1993-1995 **Browser experiments**	<MATH> Arena	HTML
1998-1999 **MathML standard**	MathML Gecko	MathML 1
2002-2003 **Gecko/Mozilla**	Mozilla 1.0	MathML 2
2006-2007 **Presto/Opera, Microsoft Office**	MathML Opera 9.5	OpenType MATH
2008 **MathML in HTML5!**	HTML5 Firefox 3.x	HTML5
2009-2011 **WebKit/Safari**	MathML WebKit	MathML 3
2012-2013 **WebKit/Chrome, Blink fork**	MathML Chrome 24	Blink Chrome 28
2014 **OpenType MATH**	OpenType WebKit/Gecko	MathML 3 2nd Edition
2015-2016 **WebKit's refactoring**	MathML WebKit	Implementation Note for MathML
2019- **Blink/Chrome, Edge switch**	MathML Chromium	MathML Core & MathML 4

THE <MATH> TAG

Consider the equation:

$$H(s) = \int_0^\infty e^{-st} h(t)\, dt$$

This can be represented as:

```
<math>
        H(s) = ∫<sub>0</sub><sup>∞</sup> e<sup>-st</sup> h(t) dt
</math>
```

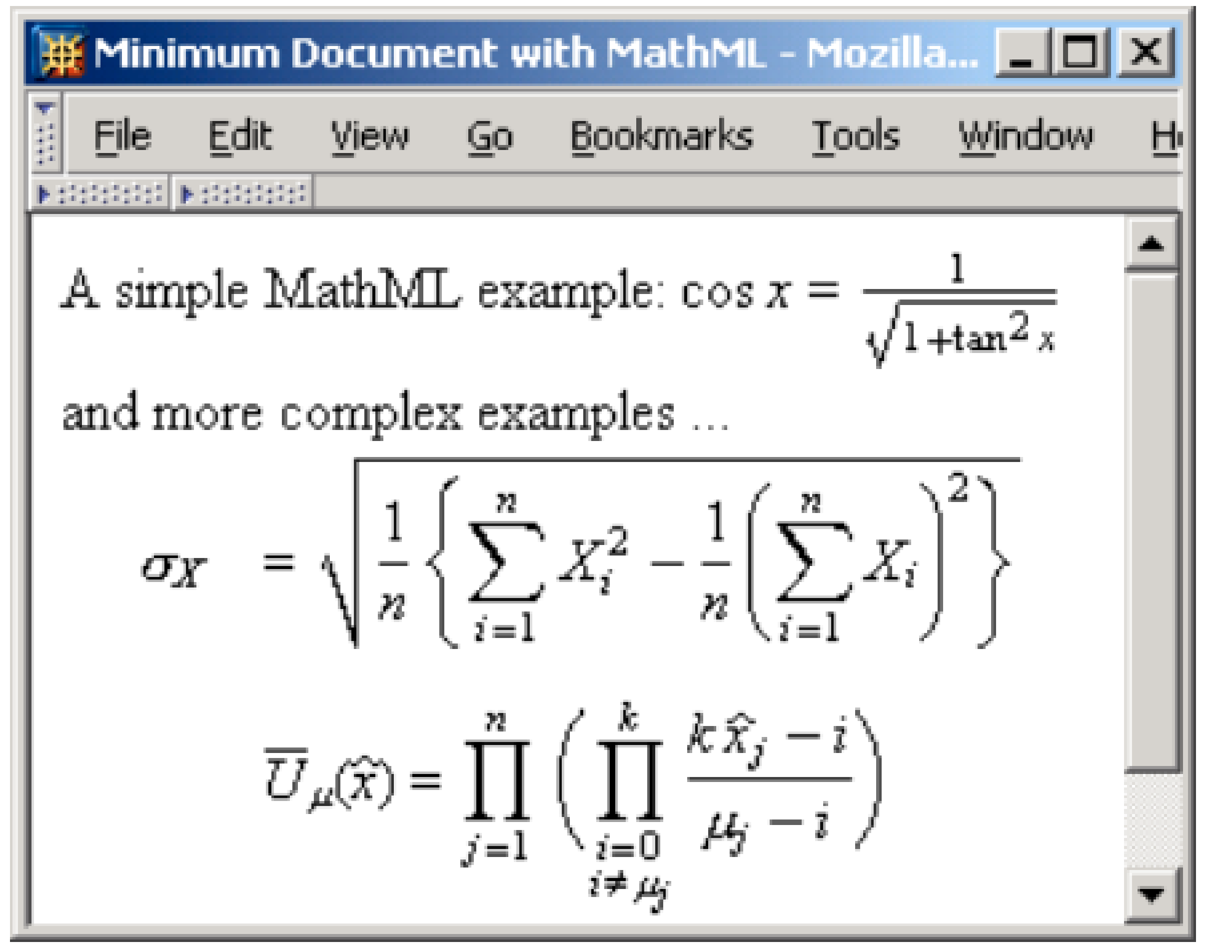
The mathematical symbols are given with their standard ISO
operators, the subscript/superscript text is centered over the
allow you to define more complex equations, as in:

$$C \frac{dV_{out}}{dt} = I_b \tanh\left(\frac{\kappa (V_{in} - V_{out})}{2}\right)$$

which is represented by:

```
<math>
        C <box>dV<sub>out</sub><over>dt</box> = I<sub>b</sub>
        &tanh;(<box>κ(V<sub>in</sub>-V<sub>out</sub>)<over>2</box>)
</math>
```

MATHML IN MOZILLA



"One of the quietest open source achievers in Australia" - the SMH

MATHML IN HTML5

MathML-in-HTML5

89 posts by 11 authors

r...@maths.uq.edu.au

Other recipients: dev-tec...@lists.mozilla.org, dev-tec...@lists.mozilla.or

I am currently driving an effort to enable MathML-in-HTML (apart from MathML-in-XHTML that we already support). I have a patch that serves the dual purpose of showing where things are going and the issues to ponder about.

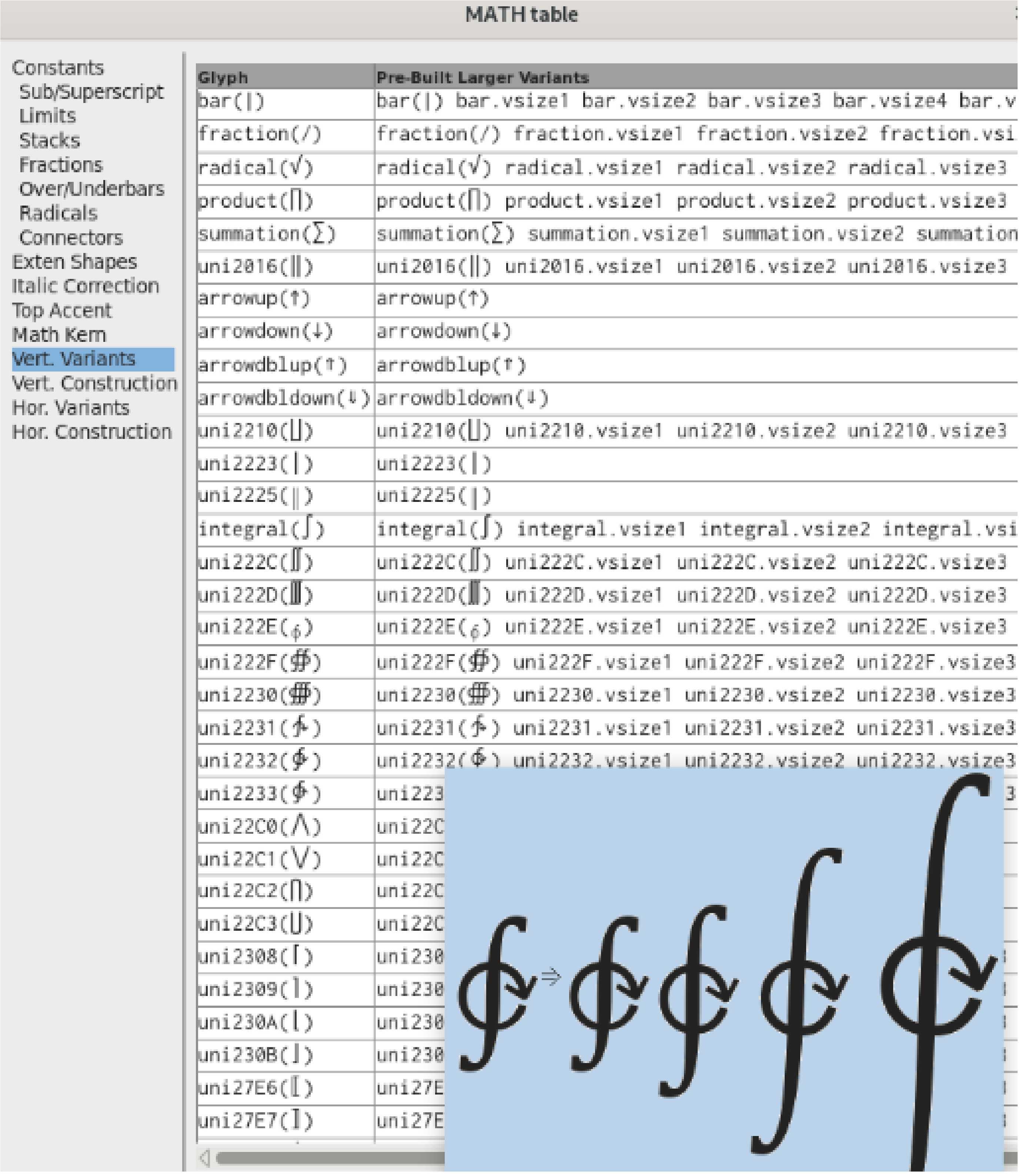
Here is a
[screenshot] https://bugzilla.mozilla.org/attachment.cgi?id=239771
which is a _live_ rendering of this testcase:
[mathml-in-html] https://bugzilla.mozilla.org/attachment.cgi?id=239769

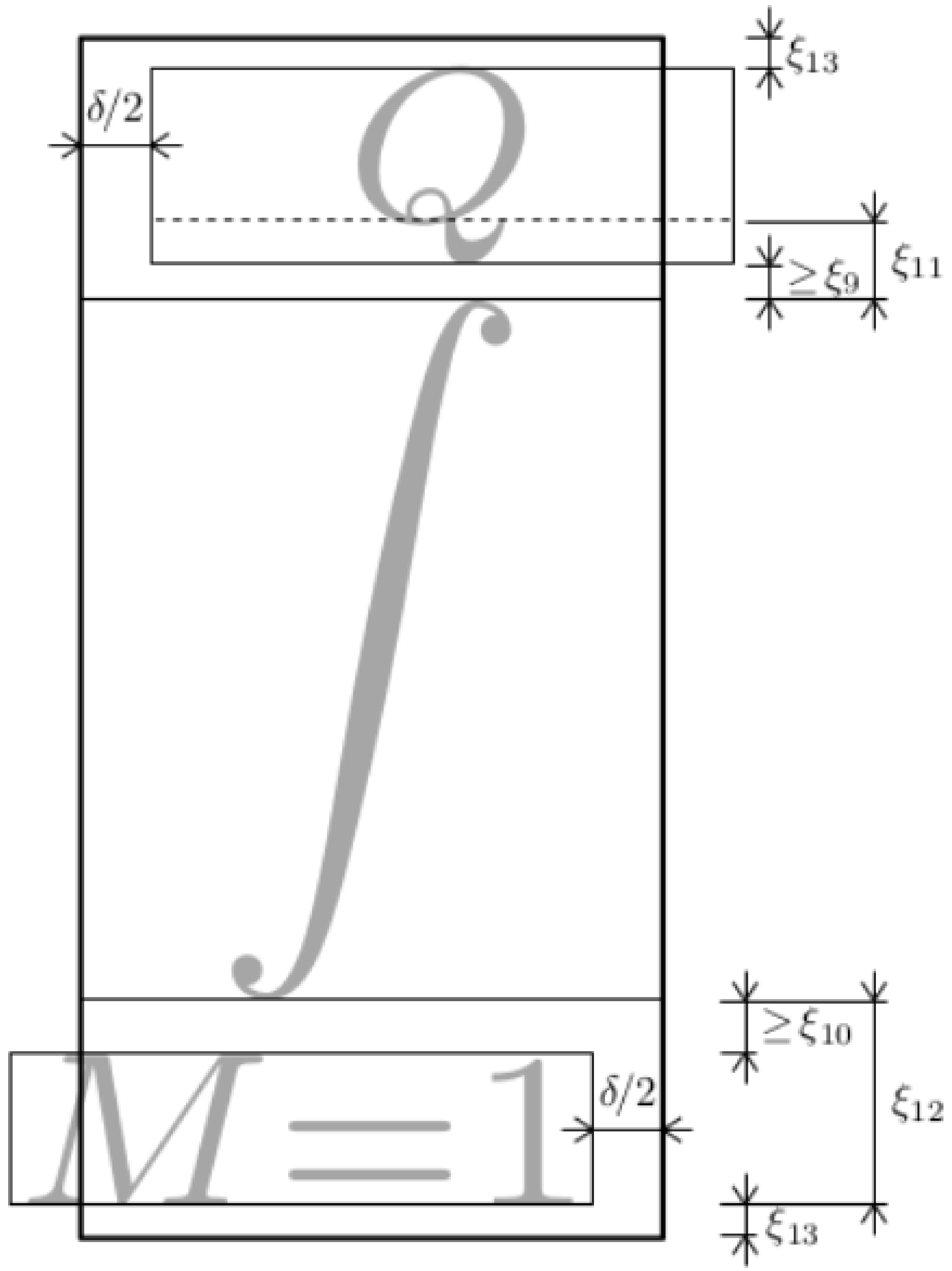
Those interested in following this up can see bug 353926:
https://bugzilla.mozilla.org/show_bug.cgi?id=353926

Quick background:
=================

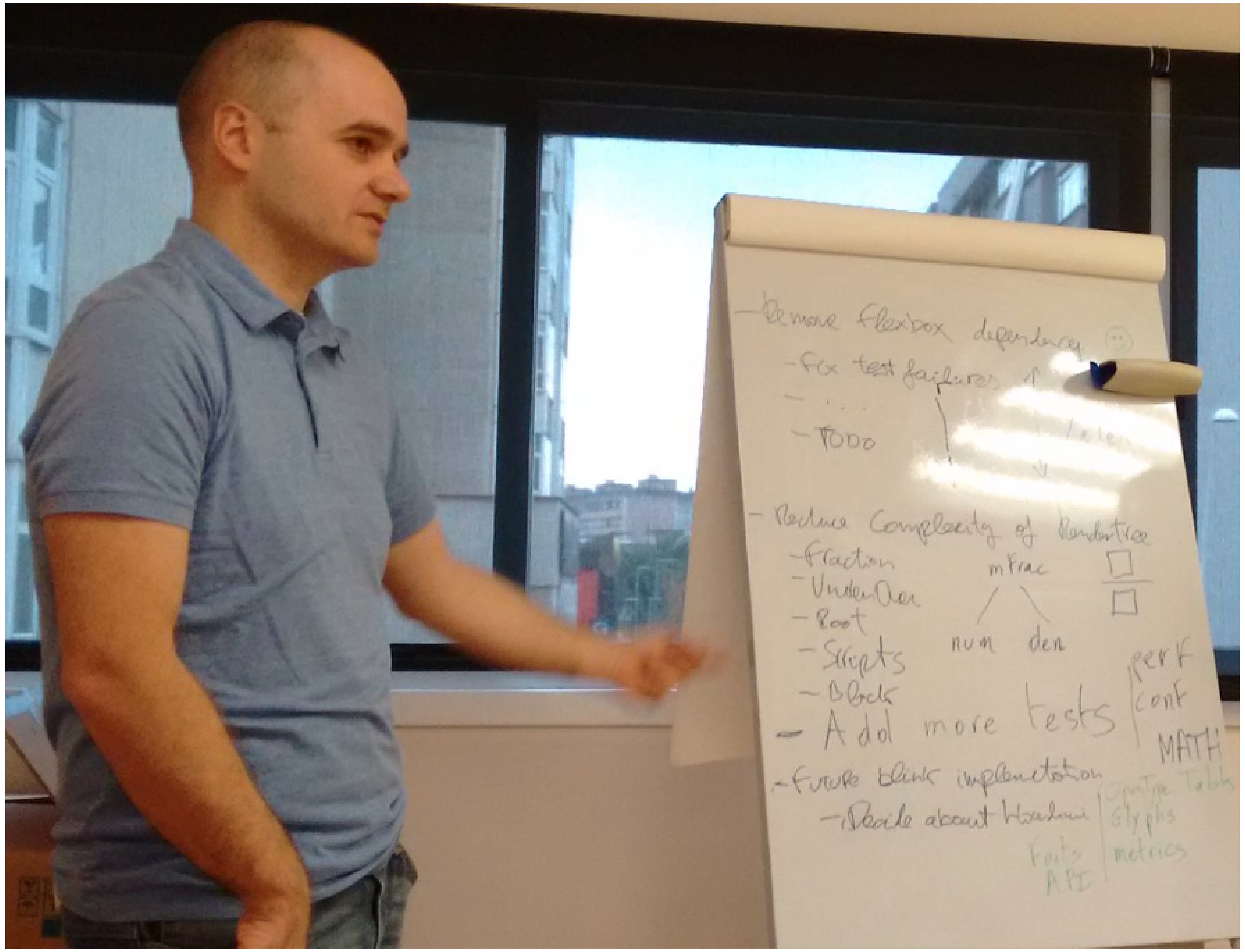
At the Firefox engineering meeting in Mountain Views (last December 2005), I pleaded that we enable MathML in HTML5 to advance the cause

MICROSOFT OFFICE 2007





WEBKIT'S REFACTORING



"¡Qué horrible es esta implementación!" - `alex@`

MATHML IN CHROMIUM

Chrome Platform Status

All features | Releases | Samples | Stats

MathML

Misc

A markup language for describing mathematical notation and capturing both its structure and content.

Comments

Igalia is working on it: https://mathml.igalia.com

Specification

Working draft or equivalent

Status in Chromium

Blink components: Blink

In development (tracking bug)

DECEMBER 6, 2018 9:00 AM

Microsoft Edge: Making the web better through more open source collaboration

By Joe Belfiore / Corporate Vice President, Windows

For the past few years, Microsoft has meaningfully increased participation in the open source software (OSS) community, becoming one of the world's largest supporters of OSS projects. Today we're announcing that we intend to adopt the Chromium open source project in the development of Microsoft Edge on the desktop to create better web compatibility for our customers and less fragmentation of the web for all web developers.

As part of this, we intend to become a significant contributor to the Chromium project, in a way that can make not just Microsoft Edge — but other browsers as well — better on both PCs and other devices.

(II) MATHML REFRESH COMMUNITY GROUP

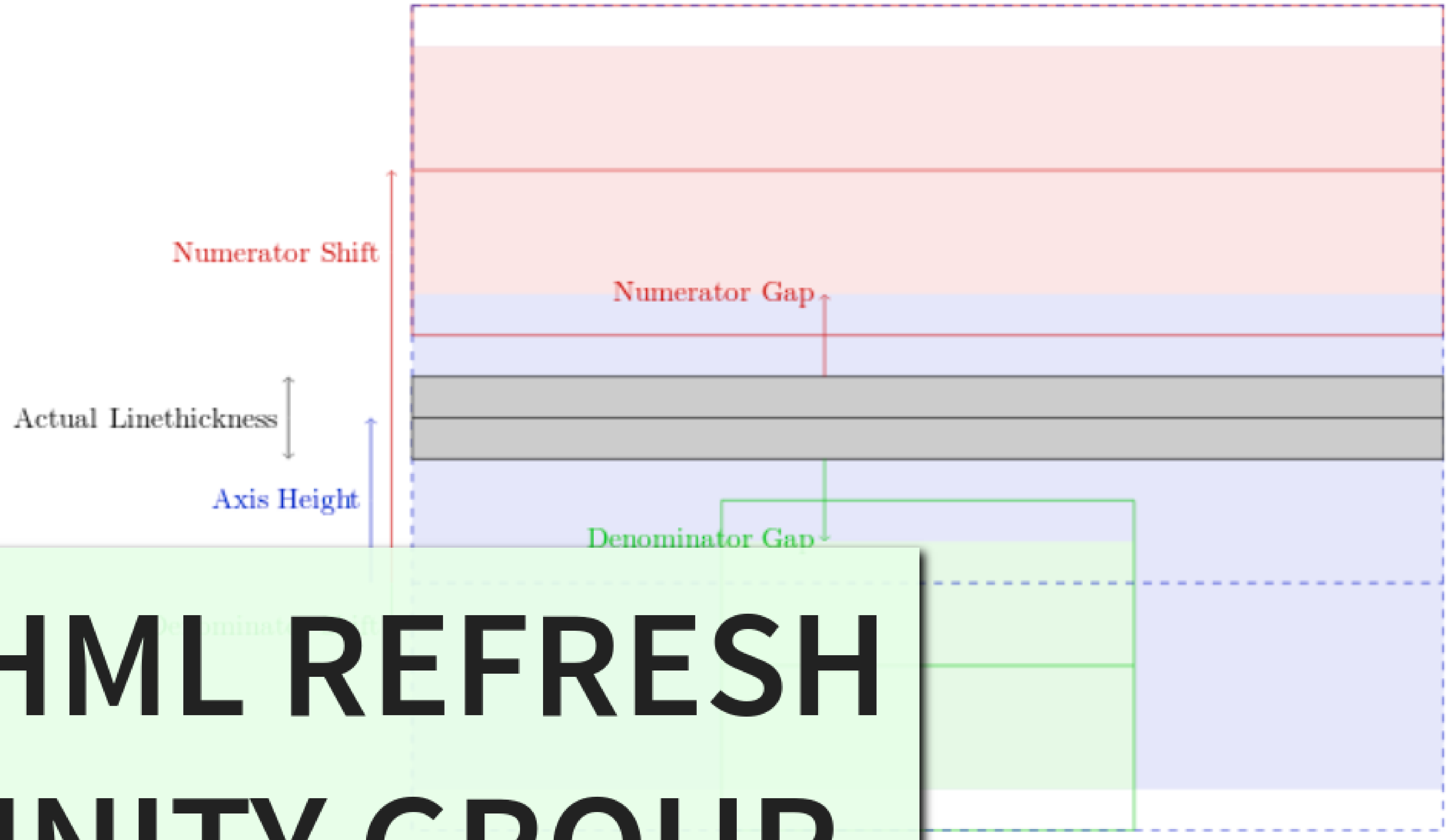


Figure 2 Box model for the `<mfrac>` element

The min-content (respectively max-content) inline size of content is the maximum between the min-content (respectively max-content) inline size of the numerator's margin box and the min-content (respectively max-content) of the denominator's margin box.

If there is an inline stretch size constraint or a block stretch size constraint then the numerator is also laid out with the same stretch size constraint otherwise it is laid out without any stretch size constraint. The denominator is always laid out without any stretch size constraint.

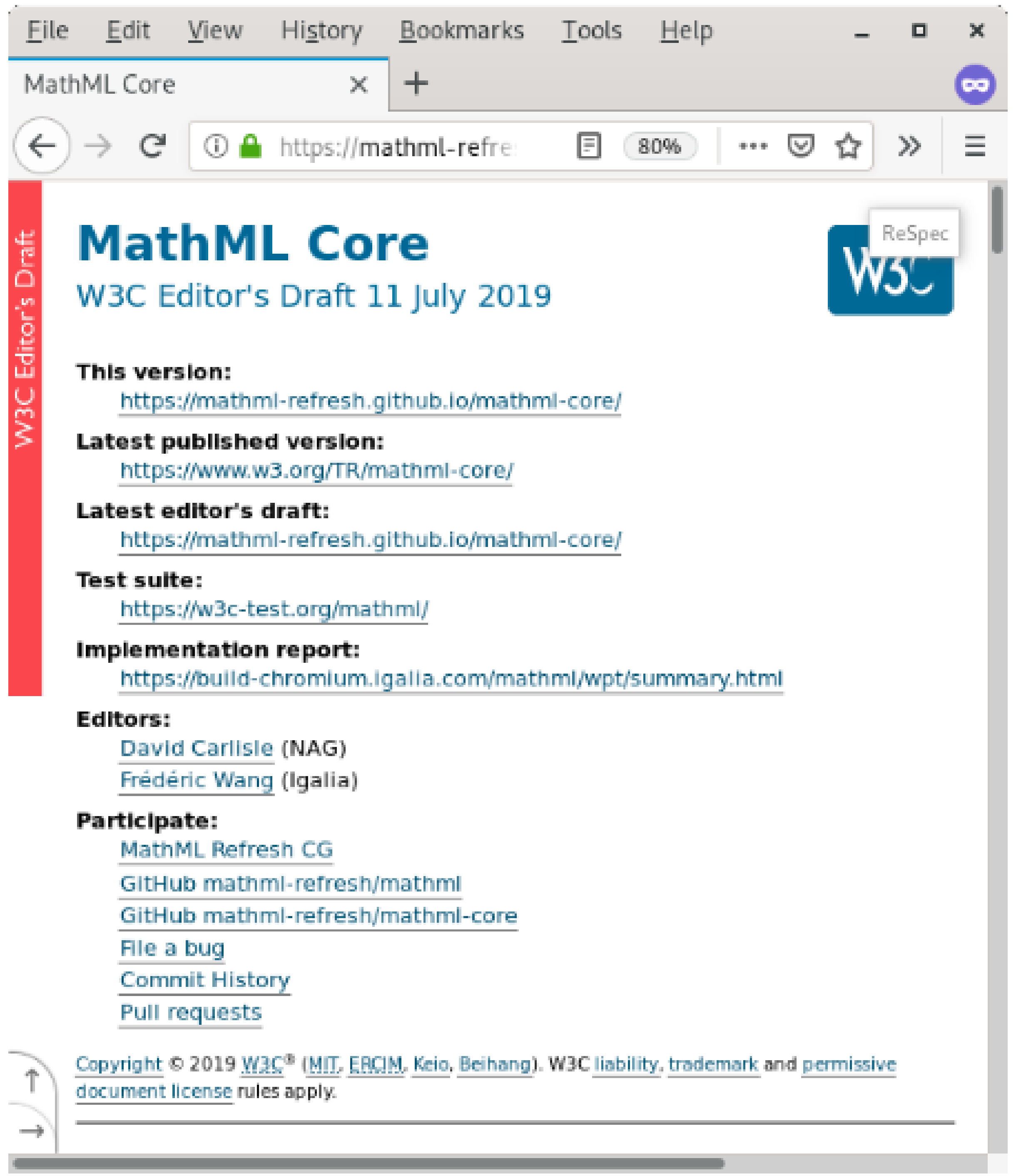
The inline size of the content is the maximum between the inline size of the numerator's margin box and the inline size of the denominator's margin box.

`NumeratorShift` is the maximum between:

- FractionNumeratorShiftUp (respectively FractionNumeratorDisplayStyleShiftUp) if the math

MATHML CORE

- Fundamental subset
  - Ask CG members
  - Analyze tools & use statistics
- Implementation details
  - TeX/OpenType layout
  - HTML5/CSS compatibility
- Browser-driven
  - Gecko/WebKit/Blink
  - Web Platform Tests!



EXTENSIBILITY

- `MathMLElement` IDL (1)
  - `*EventHandlers`
  - `ElementCSSInlineStyle`
  - `HTMLOrForeignElement`
- CSS/Houdini
  - CSS properties? (2)
  - Layout constraints? (3)
  - Font APIs? (4)
- New MathML elements
  - Overridable `display` (5)
  - Element.shadowDOM? (6)
  - Custom element? (7)

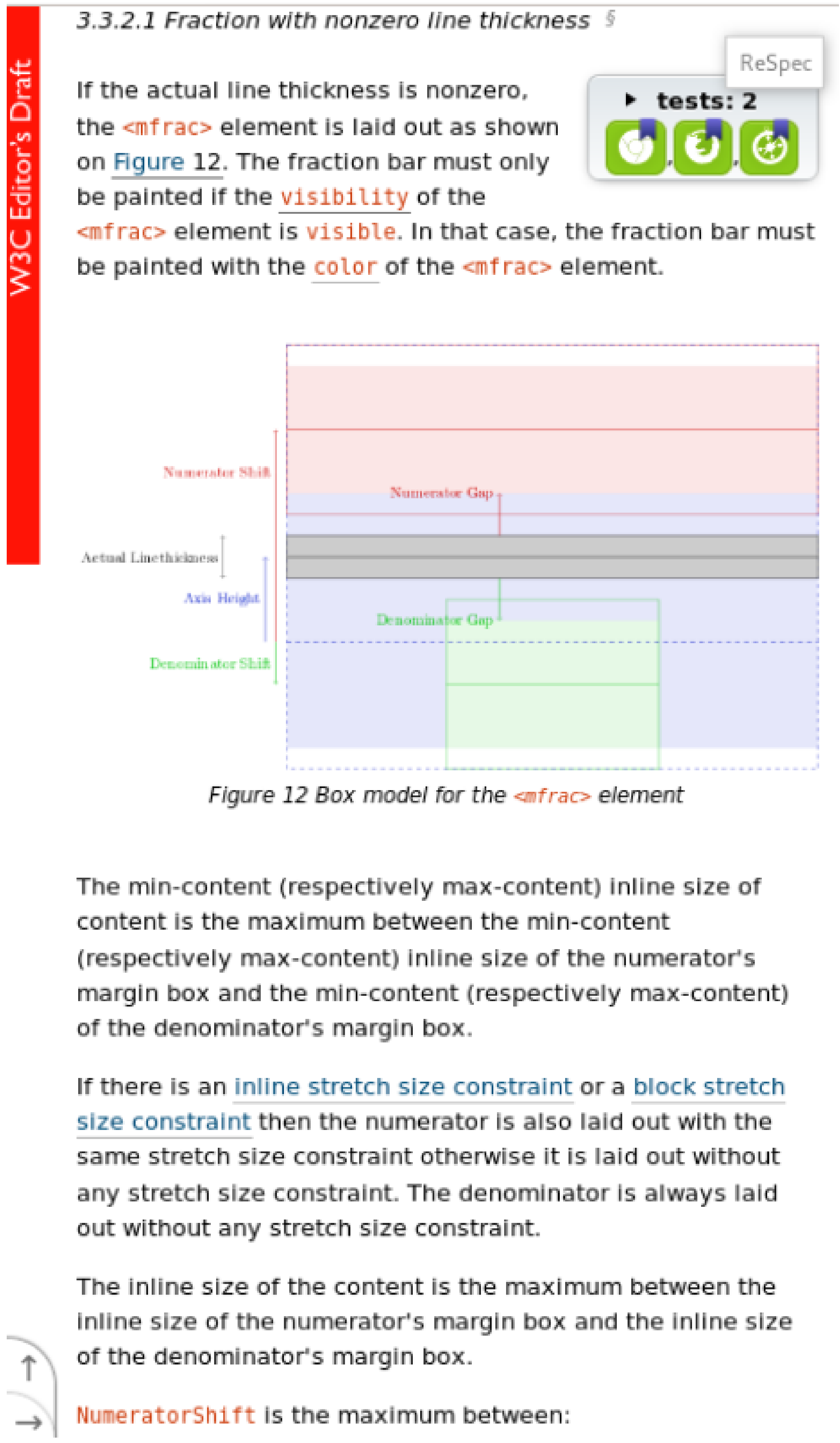
$$\frac{1+A}{2-B} \text{ VS } \frac{\mathbb{1}+\mathfrak{A}}{2-\mathcal{B}}$$

$$\displaystyle\frac{1+A}{2-B} \text{ VS } \textstyle\frac{1+A}{2-B}$$

```
<math>
  <mfenced open="{" close="]" separators=",;">
    #shadowRoot
     <mrow>
       <mo>{</mo>
       <mi>a</mi>
       <mo>,</mo>
       <mi>b</mi>
       <mo>;</mo>
       <mi>c</mi>
       <mo>]</mo>
     </mrow>
  </mfenced>
</math>
```

CSS COMPATIBILITY

- CSS layout
  - Visual box model?
  - Supported features?
  - Interpretation?
- Math-specific
  - Invalid markup
  - New CSS properties
  - OpenType parameters
  - Special painting
  - Text metrics
  - Operator Stretching



3.3.2.1 Fraction with nonzero line thickness §

If the actual line thickness is nonzero, the <mfrac> element is laid out as shown on Figure 12. The fraction bar must only be painted if the visibility of the <mfrac> element is visible. In that case, the fraction bar must be painted with the color of the <mfrac> element.

Figure 12 Box model for the <mfrac> element

The min-content (respectively max-content) inline size of content is the maximum between the min-content (respectively max-content) inline size of the numerator's margin box and the min-content (respectively max-content) of the denominator's margin box.

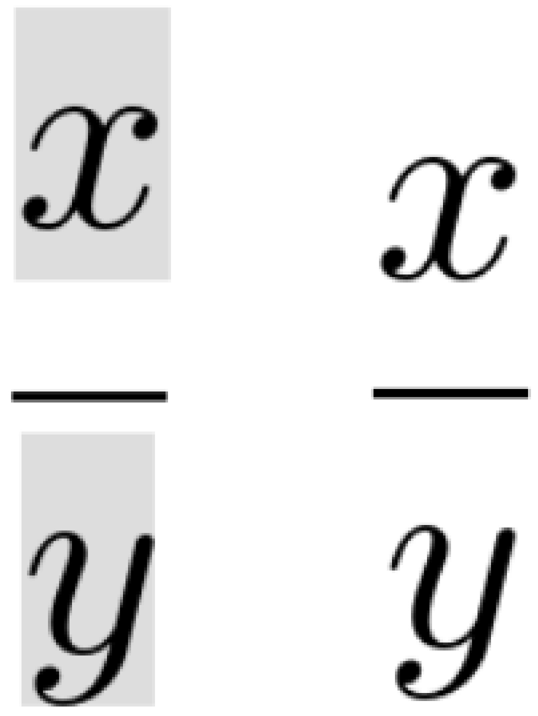
If there is an inline stretch size constraint or a block stretch size constraint then the numerator is also laid out with the same stretch size constraint otherwise it is laid out without any stretch size constraint. The denominator is always laid out without any stretch size constraint.

The inline size of the content is the maximum between the inline size of the numerator's margin box and the inline size of the denominator's margin box.

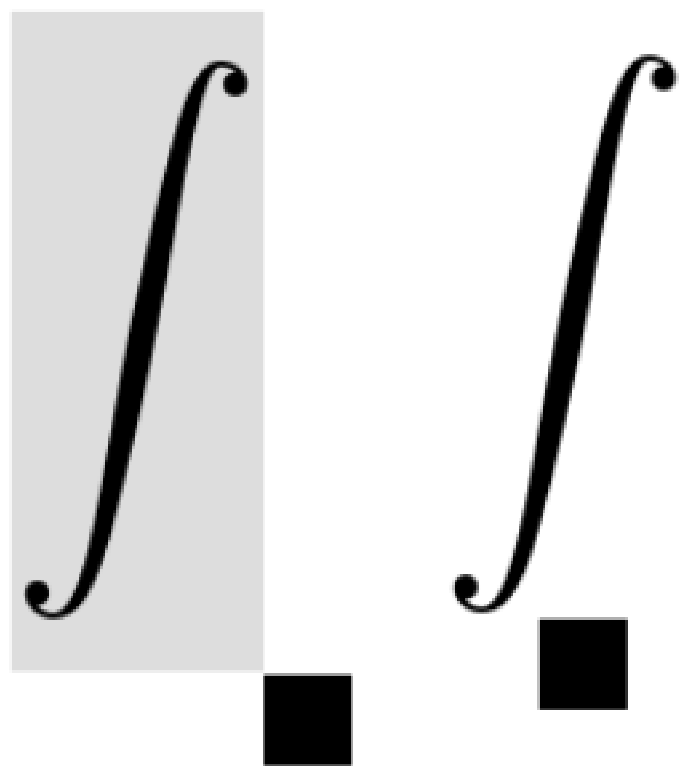
NumeratorShift is the maximum between:

TEXT METRICS

- Ink block metrics (1, 2)



- Italic correction (3)



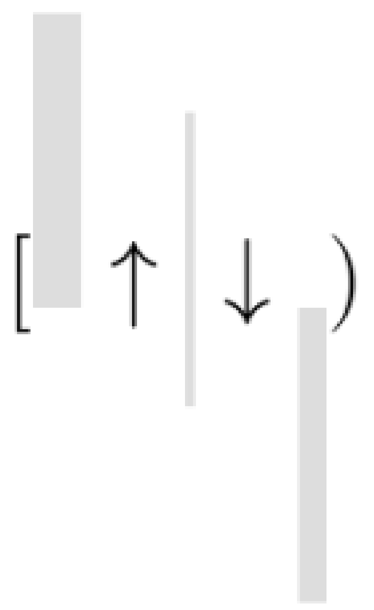
OPERATOR STRETCHING

- Stretch constraints (1)

  Horizontal stretch size

  Vertical stretch size

  above/below baseline

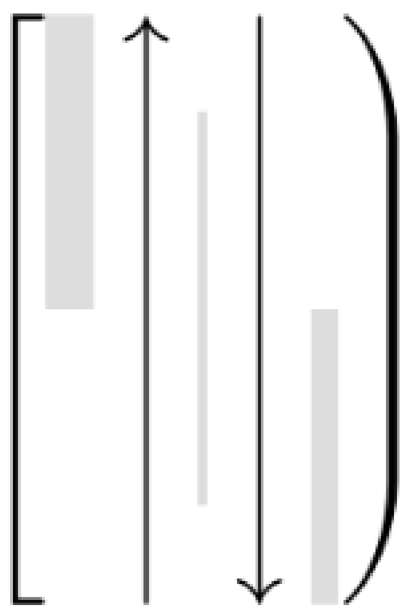


- Parent layout (2, 3)

  Layout non-stretchy children

  Calculate stretch constraint

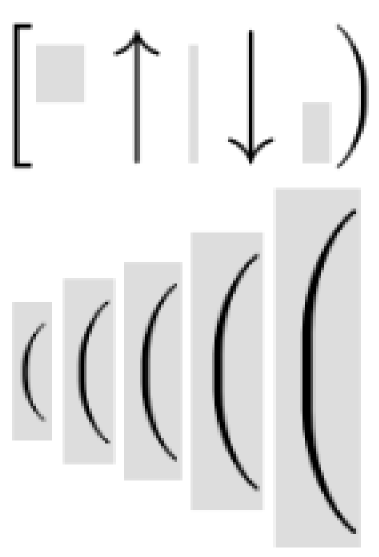
  Layout stretchy children



- Real-life operators

  ~~Distort glyph~~

  Upper estimate of min/max (4)



-platform-tests dashboard

Recent Runs Insights Processor About GitHub Source

vork in progress. The reported results do not necessarily reflect the true capabilities of each web browser, so they should not be used evaluate o
ort.

Test Results **Interoperability**

(III) BROWSER INTEROPERABILITY

les, like 'cors/allow-headers.htm', then press <Ente

For information on the search syntax, view the s

669 tests (1673955 subtests) from the latest master test runs for chrome[experimental], edge[experimental], firefox[experimental],
mental] LINK

Path	Chrome 78 Linux 18.04 8488b4e Sep 24, 2019	Edge 78 Windows 10.0 8488b4e Sep 24, 2019	Firefox 71 Linux 18.04 8488b4e Sep 24, 2019	Safari 82 pre macOS 10. 8488b4 Sep 24, 20
on-markup/	37 / 477 84 / 1502	37 / 477 84 / 1502	386 / 477 762 / 1502	348 / 477 723 / 1503

WEB PLATFORM TESTS

- ~2000 tests (1, 2, 3)
  - Math layout
  - Removed features
  - DOM/CSS interaction
- Results (4)
  - Igalia's Blink: ~99%
  - Gecko: ~73%
  - WebKit: ~72%

MathML Core - Implementation Report

Blink-MathML 1944/1971 (98.63%) +

Development build of Igalia's Chromium fork.

Blink 17/1971 (0.86%) +

Development build of Igalia's Chromium fork with the `LayoutNGMathML` runtime feature disabled.

These results might contain false positives.

Gecko 1434/1971 (72.75%) +

Nightly build of Firefox.

WebKit 1418/1971 (71.94%) +

Development build of WebKitGTK.

PAST IMPLEMENTATIONS

Firefox/Gecko
2008

$$\Gamma(t) = \int_0^{+\infty} x^{t-1} e^{-x} dx = \frac{1}{t} \prod_{n=1}^{\infty} \frac{\left(1 + \frac{1}{n}\right)^t}{1 + \frac{t}{n}} \sim \sqrt{\frac{2\pi}{t}} \left(\frac{t}{e}\right)^t$$

Chrome/WebKit
2013

$$\Gamma(t) = \int_0^{+\infty} x^{t-1} e^{-x} dx = \frac{1}{t} \prod_{n=1}^{\infty} \frac{\left(1 + \frac{1}{n}\right)^t}{1 + \frac{t}{n}} \sim \sqrt{\frac{2\pi}{t}} \left(\frac{t}{e}\right)^t$$

Opera/Presto
2007

$$\Gamma(t) = \int_0^{+\infty} x^{t-1} e^{-x} dx = \frac{1}{t} \prod_{n=1}^{\infty} \frac{(1 + \frac{1}{n})^t}{1 + \frac{t}{n}} \sim \sqrt{\frac{2\pi}{t}} \left(\frac{t}{e}\right)^t$$

2019 IMPLEMENTATIONS

Firefox/Gecko
July release

$$\Gamma(t) = \int_0^{+\infty} x^{t-1} e^{-x} dx = \frac{1}{t} \prod_{n=1}^{\infty} \frac{\left(1+\frac{1}{n}\right)^t}{1+\frac{t}{n}} \sim \sqrt{\frac{2\pi}{t}} \left(\frac{t}{e}\right)^t$$

Epiphany/WebKit
Build r249360

$$\Gamma(t) = \int_0^{+\infty} x^{t-1} e^{-x} dx = \frac{1}{t} \prod_{n=1}^{\infty} \frac{\left(1+\frac{1}{n}\right)^t}{1+\frac{t}{n}} \sim \sqrt{\frac{2\pi}{t}} \left(\frac{t}{e}\right)^t$$

Chromium/Blink
Igalia's Branch

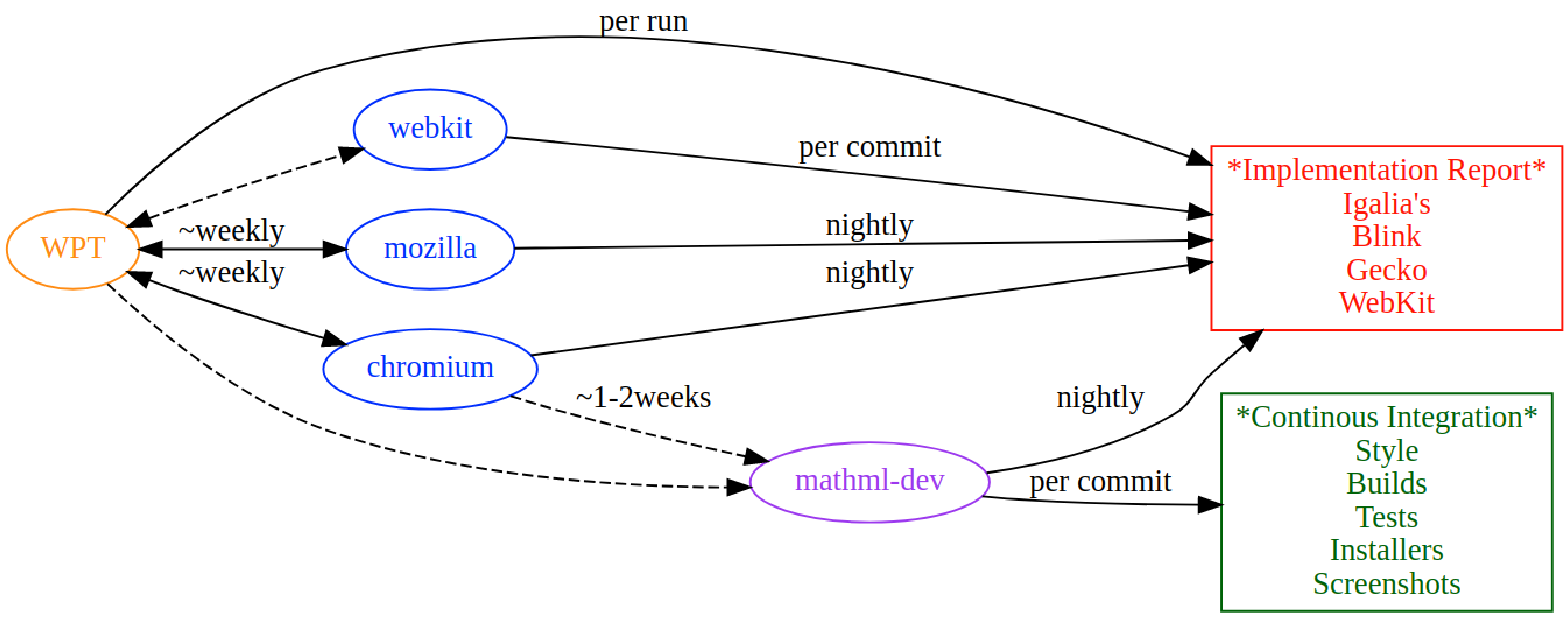
$$\Gamma(t) = \int_0^{+\infty} x^{t-1} e^{-x} dx = \frac{1}{t} \prod_{n=1}^{\infty} \frac{\left(1+\frac{1}{n}\right)^t}{1+\frac{t}{n}} \sim \sqrt{\frac{2\pi}{t}} \left(\frac{t}{e}\right)^t$$

GECKO AND WEBKIT (1, 2)

- Standardize browser behaviors
  - MathML3 interpretations
  - "Hacks" for legacy content
- Unship features
  - Counters & Deprecation (3)
  - Runtime flag
- Tests
  - Convert & synchronize
  - More "pass" / Less "flaky"
- Enhancement and bug fixes
  - `Math DOM` (4, 5)
  - Math layout (6, 7, 8, …)
  - CSS compatibility

(IV) MATHML IN CHROMIUM

PROJECT WORKFLOW



- Upstream mathml-dev!
- Non-Linux platforms?
- Automated WPT sync for WebKit 🙄

IMPLEMENTATION ROADMAP

- Basic setup ✓
- Basic layout ✓
- Operator Dictionary ✓
- Stretchy operators: ✓
- Advanced style ✓
- HTML5 Compatibility ●
- Upstreamed & shipped ✗

$$\lim_{n \to +\infty} \frac{\sqrt{2\pi n}}{n!} \left(\frac{n}{e}\right)^n = 1$$

$$\det(A) = \sum_{\sigma \in S_n} \epsilon(\sigma) \prod_{i=1}^{n} a_{i,\sigma_i}$$

CHANGESETS

Base Setup

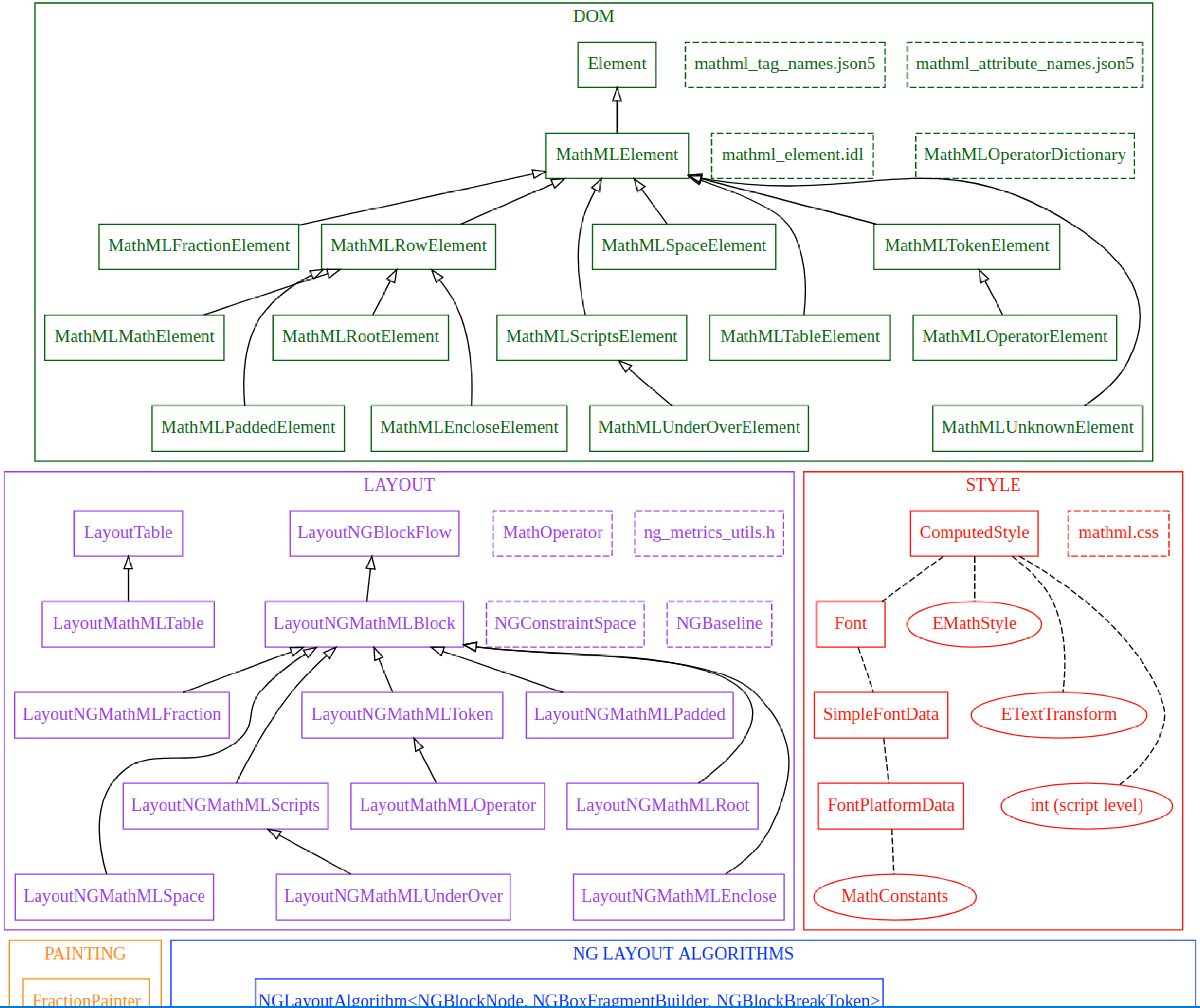
- Runtime flag
- `mathml.css`
- Element classes
- New CSS
- New DOM/IDL

Low-level API

- Font parameters
- Glyph stretching
- Layout constraints
- Ink baselines

MathML

- Dictionary
- Attributes
- Painters
- Layout utils
- Layout classes


DOM
Element
mathml_tag_names.json5
mathml_attribute_names.json5
MathMLElement
mathml_element.idl
MathMLOperatorDictionary
MathMLFractionElement
MathMLRowElement
MathMLSpaceElement
MathMLTokenElement
MathMLMathElement
MathMLRootElement
MathMLScriptsElement
MathMLTableElement
MathMLOperatorElement
MathMLPaddedElement
MathMLEncloseElement
MathMLUnderOverElement
MathMLUnknownElement
LAYOUT
LayoutTable
LayoutNGBlockFlow
MathOperator
ng_metrics_utils.h
LayoutMathMLTable
LayoutNGMathMLBlock
NGConstraintSpace
NGBaseline
LayoutNGMathMLFraction
LayoutNGMathMLToken
LayoutNGMathMLPadded
LayoutNGMathMLScripts
LayoutMathMLOperator
LayoutNGMathMLRoot
LayoutNGMathMLSpace
LayoutNGMathMLUnderOver
LayoutNGMathMLEnclose
STYLE
ComputedStyle
mathml.css
Font
EMathStyle
SimpleFontData
ETextTransform
FontPlatformData
int (script level)
MathConstants
PAINTING
FractionPainter
NG LAYOUT ALGORITHMS
NGLayoutAlgorithm<NGBlockNode, NGBoxFragmentBuilder, NGBlockBreakToken>

SIZE IMPACT

CHROME

```
is_debug=0
is_official_build=1
enable_linux_installer=1
```

- Binary: **Δ < 320KB**
- Archive:

  deb: **Δ < 45KB**
  rpm: **Δ < 26KB**

CODE

Folders	#Lines
`core/layout/ng/mathml`	4977
`core/mathml`	3279
`core/css`, `core/style`	940
`core/paint`	285
`platform/fonts`, `platform/graphics`	268
`core/layout`, `core/layout/ng`	164
`core/dom`, `core/html`, `core/svg`	44
Total	**Δ < 10k**

Current SVG code size (only for `core/svg`, `core/layout/svg`) is **> 62k**

LAUNCHING FEATURES

- **Idea Phase:** explainer, intent-to-implement
- **Design Phase:** design doc & spec, TAG review, chromestatus entry, chrome launch review
- **Implementation Phase:** implementation & tests, intent-to-ship, 3 LGTMs
- **Post Launch:** crashes, regressions, bug fixes, interop, doc, cleanup...

(V) MATHML DEMOS

Elements Console 3

```
        \int_{0}^{+\infty}
        (2x+1) \frac{e^{-3x}}{-3}
        d x = \frac{1}{3} + \frac{1}{3}
        \int_{0}^{+\infty}
        (2x+1) e^{-3x}
        d x
      "
  </la-tex>
▸ <p>…</p>
▾ <la-tex display="block">
  ▾ #shadow-root (open)
    ▸ <math display="block" xmlns="http://www.w3.org/1998/Math/MathML">…</math>
    "
        \int_{0}^{+\infty}
        (2x+1) e^{-3x}
        d x
        = \left[(2x + 1) \frac{e^{-3x}}
    {-3}\right]_{0}^{+\infty} -
        \int_{0}^{+\infty}
        2 \frac{e^{-3x}}{-3}
        d x = \frac{1}{3} + \frac{2}{3}
        \int_{0}^{+\infty} e^{-3x} d x
      "
  </la-tex>
▸ <p>…</p>
▾ <la-tex display="block">
  ▾ #shadow-root (open)
```

html body la-tex #shadow-root math

Styles Computed Event Listeners DOM Breakpoints

Filter :hov .cls +

Example 1

Consider

$$\int_0^{+\infty}(x^2+x+1)e^{-3x}dx$$

We consider $f(x)=x^2+x+1$ and $g(x)=\frac{e^{-3x}}{-3}$ that is $f^{'}(x)=2x+1$ and $g^{'}(x)=e^{-3x}$. The integral can be written $\int fg^{'}dx$ and hence we get

$$\left[(x^2+x+1)\frac{e^{-3x}}{-3}\right]_0^{+\infty}-\int_0^{+\infty}(2x+1)\frac{e^{-3x}}{-3}dx=\frac{1}{3}+\frac{1}{3}\int_0^{+\infty}(2x+1)e^{-3x}dx$$

We now consider $h(x)=2x+1, h^{'}(x)=2$ the second integral can be written $\int hg^{'}dx$ and hence

$$\int_0^{+\infty}(2x+1)e^{-3x}dx=\left[(2x+1)\frac{e^{-3x}}{-3}\right]_0^{+\infty}-\int_0^{+\infty}2\frac{e^{-3x}}{-3}dx=\frac{1}{3}+\frac{2}{3}\int_0^{+\infty}e^{-3x}dx$$

$$\int_0^{+\infty}e^{-3x}dx=\left[\frac{e^{-3x}}{-3}\right]_0^{+\infty}=\frac{1}{3}$$

Finally,

$$\int_0^{+\infty}(x^2+x+1)e^{-3x}dx=\frac{1}{3}+\frac{1}{3}\times\left(\frac{1}{3}+\frac{2}{3}\times\frac{1}{3}\right)=\frac{14}{27}$$

Example 2

$$\int_1^2 x^3(2\ln x+7\arctan x)dx$$

We let $f(x)=2\ln x+7\arctan x$ and $g(x)=\frac{x^3}{3}$. Hence $f^{'}(x)=\frac{2}{x}+\frac{7}{1+x^2}$ and $g^{'}(x)=x^3$. The integration by parts gives:

	As rendered by TeX	As rendered by your browser
1	x^2y^2	x^2y^2
2	${}_2F_3$	${}_2F_3$
3	$\frac{x+y^2}{k+1}$	$\frac{x+y^2}{k+1}$
4	$x+y^{\frac{2}{k+1}}$	$x+y^{\frac{2}{k+1}}$
5	$\frac{a}{b/2}$	$\frac{a}{b/2}$
6	$a_0+\cfrac{1}{a_1+\cfrac{1}{a_2+\cfrac{1}{a_3+\cfrac{1}{a_4}}}}$	$a_0+\cfrac{1}{a_1+\cfrac{1}{a_2+\cfrac{1}{a_3+\cfrac{1}{a_4}}}}$
7	$a_0+\frac{1}{a_1+\frac{1}{a_2+\frac{1}{a_3+\frac{1}{a_4}}}}$	$a_0+\frac{1}{a_1+\frac{1}{a_2+\frac{1}{a_3+\frac{1}{a_4}}}}$
8	$\binom{n}{k/2}$	$\binom{n}{k/2}$
9	$\binom{p}{2}x^2y^{p-2}-\frac{1}{1-x}\frac{1}{1-x^2}$	$\binom{p}{2}x^2y^{p-2}-\frac{1}{1-x}\frac{1}{1-x^2}$
10	$\sum_{\substack{0\le i\le m\\ 0<j<n}} P(i,j)$	$\sum_{\substack{0\le i\le m\\ 0<j<n}} P(i,j)$
11	x^{2y}	x^{2y}
12	$\sum_{i=1}^p\sum_{j=1}^q\sum_{k=1}^r a_{ij}b_{jk}c_{ki}$	$\sum_{i=1}^p\sum_{j=1}^q\sum_{k=1}^r a_{ij}b_{jk}c_{ki}$
13	$\sqrt{1+\sqrt{1+\sqrt{1+\sqrt{1+\sqrt{1+\sqrt{1+\sqrt{1+x}}}}}}}$	$\sqrt{1+\sqrt{1+\sqrt{1+\sqrt{1+\sqrt{1+\sqrt{1+\sqrt{1+x}}}}}}}$
14	$\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right)\lvert\varphi(x+iy)\rvert^2=0$	$\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right)\lvert\varphi(x+iy)\rvert^2=0$
15	$2^{2^{2^x}}$	$2^{2^{2^x}}$
16	$\int^x dt$	$\int^x dt$

<la-tex> Custom Element

Basic Integration

Ideas

If F is a primitive of f then $\int_a^b f(x)dx = F(b) - F(a)$, provided the integrand and integral have no singularities on the path of integration. As a consequence, we can use a table of derivatives:

	Function	Derivative
Linearity	$af + bg$	$af' + bg'$
Leibniz rule	fg	$f'g + gf'$
Reciprocal rule	$\frac{1}{f}$	$-\frac{f'}{f^2}$
Chain Rule	$f \circ g$	$(f' \circ g)g'$
Inverse function rule	f^{-1}	$\frac{1}{f' \circ f^{-1}}$
Elementary power rule	x^n	nx^{n-1}
Generalized power rule	$f^g = e^{g\ln(f)}$	$f^g\left(f'\frac{g}{f} + g'\ln(f)\right)$
Exponential	$\exp x$	$\exp x$
Logarithm	$\ln x$	$\frac{1}{x}$
Sine	$\sin x$	$\cos x$
Cosine	$\cos x$	$-\sin x$
Tangent	$\tan x$	$\frac{1}{\cos^2 x} = 1 + \tan^2 x$

Examples

Using linearity and elementary power rule:

$$\int_0^1 u^4 - 2u^3 + 5u^2 + 4du = \left[\frac{u^5}{5} - 2\frac{u^4}{4} + 5\frac{u^3}{3} + 4u\right]_{u=0}^1 = \frac{161}{30}$$

Using linearity and sine/cosine:

$$\int_0^\pi 2\cos(\theta) - 3\sin(\theta)d\theta = [2\sin(\theta) + 3\cos(\theta)]_{\theta=0}^\pi = -6$$

Using Leibniz rule, Chain rule and Exponential/Power:

$$\int_0^2 2xe^{-3x} - 3x^2e^{-3x}dx = [x^2e^{-3x}]_0^2 = \frac{4}{e^{12}}$$

Using the inverse function rule and tangent:

$$\int_0^1 \frac{1}{1+x^2}dx = \int_0^1 \frac{1}{\tan'(\arctan(x))}dx = [\arctan(x)]_0^1 = \frac{\pi}{4}$$

Using linearity, reciprocal rule and logarithm:

$$\int_2^3 \frac{1}{v(\ln(v))^2}dv = -\int_2^3 -\frac{\frac{1}{v}}{(\ln(v))^2}dv = -\left[\frac{1}{\ln(v)}\right]_2^3 = \frac{1}{\ln 2} - \frac{1}{\ln 3}$$

LaTeX-to-MathML converter

Display Mode ▾ ; RTL ▾ ; Riemann zeta function at even positive integer ▾
Font: Latin Modern ▾

```
{ζ(2k)} =
∑_{n=1}^∞ \frac{1}{n^{2k}} =
{(-1)}^{k+1}\frac{{(2\pi)}^{2k}}{2{(2k)}!}
\left(\sum _{m=0}^{2k}\sum _{l=0}^{m}{(-1)}^{l}{\binom {m}{l}}{\frac {l^{2k}}
{m+1}}\right)
```

$${\zeta(2k)} = \sum_{n=1}^\infty \frac{1}{n^{2k}} = {(-1)}^{k+1}\frac{{(2\pi)}^{2k}}{2{(2k)}!} \left(\sum _{m=0}^{2k}\sum _{l=0}^{m}{(-1)}^{l}{\binom {m}{l}}{\frac {l^{2k}}{m+1}}\right)$$

Padding, border and margin

$$\Gamma(t) = \int_0^{+\infty} x^{t-1} e^{-x} dx = \frac{1}{t} \prod_{n=1}^{\infty} \frac{\left(1+\frac{1}{n}\right)^t}{1+\frac{t}{n}} \sim \sqrt{\frac{2\pi}{t}} \left(\frac{t}{e}\right)^t$$

$$\Gamma(t) = \int_0^{+\infty} x^{t-1} e^{-x} dx = \frac{1}{t} \prod_{n=1}^{\infty} \frac{\left(1+\frac{1}{n}\right)^t}{1+\frac{t}{n}} \sim \sqrt{\frac{2\pi}{t}} \left(\frac{t}{e}\right)^t$$

$$\Gamma(t) = \boxed{\int_0^{+\infty} x^{t-1} e^{-x} dx} = \frac{1}{t} \prod_{n=1}^{\infty} \frac{\left(1+\frac{1}{n}\right)^t}{1+\frac{t}{n}} \sim \sqrt{\frac{2\pi}{t}} \left(\frac{t}{e}\right)^t$$

$$\Gamma(t) = \boxed{\int_0^{+\infty} x^{t-1} e^{-x} dx} = \frac{1}{t} \prod_{n=1}^{\infty} \frac{\left(1+\frac{1}{n}\right)^t}{1+\frac{t}{n}} \sim \sqrt{\frac{2\pi}{t}} \left(\frac{t}{e}\right)^t$$

Custom display values

Flexbox and Grid

$$\sqrt[{\begin{matrix}3\\2\\1\end{matrix}}^{\alpha}]{\begin{matrix}1&2&3\\4&5&6\\7&8&9\end{matrix}}$$

CSS Layout API

Click a B to toggle between mmultiscripts and custom layout:

$$\frac{1}{2}+\boxed{B_{135}^{246}}-\boxed{B_{\frac{1}{2}}^{\sqrt{3}}}+\sqrt{7^{f}+k}$$

(VI) ¿QUESTIONS?