Unit 15, part 50.1 **Baustelle**

Aphorisms, advices, anecdotes, brain teasers, curious stories, epigrams, epigraphs, epitaphs, ideas, crazy-creative ideas, koans, memorabilia, mottos, poems, proverbs, quotations, riddles, sayings, slogans, scurrilities, besun, etc.
collected for encouragement and the advantage of my students and myself.

Wort-Fundstücke, Gehörtes, Gelesenes, Zugelaufenes, …

Tradition ist Bewahrung des Feuers und nicht Anbetung der Asche.
Gustav Mahler

Kein Feuer – keine Asche.

Ernachtet – noctuvigilus – nocturnal – nocturno

„Extraterrestric“ greeting phrases

** May the Force be with you.
Star Wars universe

** Lebe lang und in Frieden.
Lebe lang und erfolgreich (Live long and prosper).
Vulkanischer Gruß, Star-Trek-Universum

** nuqneH = Was willst du?
Klingonischer Gruß, Star-Trek-Universum

** Find more.

Fliessend Wasser belebt das Geschäft.

The velocity of light is the jailer in our universe.

Number rules the universe.

Motto of the Pythagoreans

Computational thinking

P. Curzon, P.W. McOwan. The Power of Computational Thinking:
Games, Magic and Puzzles to Help You Become a Computational Thinker.
World Scientific Publishing Europe Ltd 2017, ISBN 978-1786341846

Neben Ideen gründet Forschung im Wesentlichen auf Gespür für verborgene Zusammenhänge.

** K. Hartnett. Die seltsamen Zahlen der Teilchenkollisionen.
Spektrum der Wissenschaft 8.17, S. 66-71

** „Change lobsters“: Does this 25 year-old hold the key to winning the war against superbugs?

http://www.telegraph.co.uk/health-fitness/body/does-this-25-year-old-hold-the-key-to-winning-the-war-against-th/

** Find more.

Und allgemach vergißt man seiner.

Wilhelm Busch

Klaatu barada nikto.

The Day the Earth Stood Still.

EME

https://en.wikipedia.org/wiki/Earth%E2%80%93Moon%E2%80%93Earth_communication
https://de.wikipedia.org/wiki/Erde-Mond-Erde
http://www.amateurfunk-wiki.de/index.php?title=Erde-Mond-Erde

http://www.radio.garden/

Fordere mehr, als Du bekommen kannst.
Septonisches Sprichwort

Motivationsstiftend

** »In unserm Weinberg liegt ein Schatz,
graben nur danach!« – »An welchem Platz?«
Gottfried August Bürger Die Schatzgräber

** Man muß nur den Trick kennen, diesen Speicher anzuzapfen.
In der Straßenbahn Linie 11 gehört.

** In the debating club 49
Is money a creativity motivator?
Goede Award, Deb 79, Deb 103, BEAL's Conjecture

** „Die physische und soziale Umgebung ist ein wichtiger Faktor für kreatives Denken. Sich mit interessanten, vielseitigen Dingen und Menschen zu umgeben, ist das Benzin, mit dem Sie Ihr Denken und Fühlen befeuern."
Robert Epstein

** "The NakaMats method of invention involves diving underwater without an oxygen tank or snorkel and staying below the surface for as long as possible until an idea bubbles up. Upon resurfacing, he then writes down the idea on a dripping-wet Plexiglas tablet.
http://www.whatagreatidea.com/nakamatsu.htm

Ist es möglich, Elektromotoren im Leistungsbereich < 0.1W/1mW vollständig aus nichtmetallischen Werkstoffen herzustellen? Discuss the related physical, engineering, and technological (3D printing?) problems as well as possible application areas.

References

[1] https://www.faulhaber.com/de/de/

Find simple recursion formulas for the calculation of

e^e, $e^{\frac{1}{e}}$, π^π, $\pi^{\frac{1}{\pi}}$, e^π, $e^{\frac{1}{\pi}}$, π^e, and $\pi^{\frac{1}{e}}$.

See Units 101 and 103.

Possible or impossible?

Given

$n \in \mathbb{N}$

Find

$$n_{red} = \prod_{i=1}^{\infty} p_1^{\operatorname{sgn}(k_i)}$$

without prime factorization of n

$$n = \prod_{i=1}^{\infty} p_i^{k_i}; \quad p_1=2, p_2=3, p_3=5, p_4=7, p_5=11, \ldots$$

$$k_i \in \mathbb{N}_0$$

using an $u = v*\mathrm{div}(u,v) + \mathrm{rest}(u,v)$ algorithm (see Unit 15, part 49.2).

Example

$n = 1038543363 \; (\Rightarrow 3^5*11^3*13^2*19)$

via searched algorithm $\Rightarrow n_{red} = 8151$

Discuss the course of the function

$$f(s,x) = \sum_{i=0}^{\infty} \frac{x^i}{(i!)^s} \; ; \; s \in \mathbb{N}$$

for $x \in \mathbb{R}$ and for $x \in \mathbb{C}$.

Draw the graphs of $f(s,x)$ for $x \in \mathbb{R}$ with s as a parameter.

Hint

$f(1,x) = e^x$; $f(2,x) = I_0(2\sqrt{x})$.

Sixtics

$6 = 1 + 2 + 3 = 1 * 2 * 3$

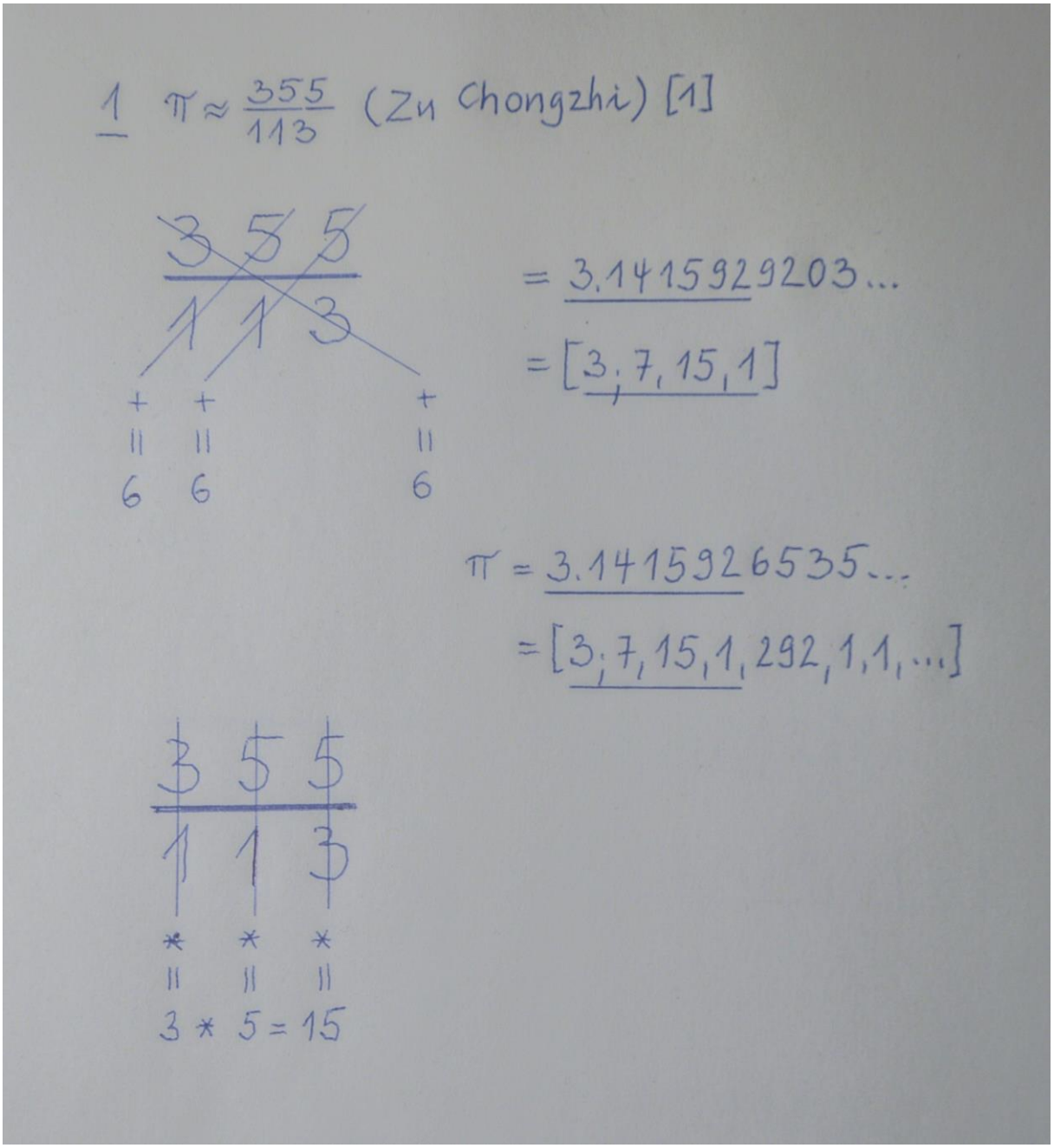
$6^2 = 1^3 + 2^3 + 3^3 = 1^2 * 2^2 * 3^2$

$$\frac{6^3}{2} = 1^1 * 2^2 * 3^3 \; ; \; \frac{2^6}{2} = 1^1 + 2^2 + 3^3$$

$$1+\cfrac{1}{2+\cfrac{1}{3}}=\frac{10}{7}=\overline{1.42857...}_{10}$$

$$\underbrace{4\quad 5}_{9}$$

$$\underbrace{1\qquad 7}_{8}$$



Find more.

References

[1] Ancient China's Technology and Science.
Beijing 2009, p.93-94
ISBN 978-7-119-05754-5

[2] D. Wells. The Penguin Dictionary of
Curious and Interesting Numbers.
p. 48-50, 51-53, 171-175
Penguin Books 1998
ISBN 978-0140261493

John Wallis is still alive

John Wallis found in1655 an infinite product representation for π/2 [1,2,3]

$$\frac{\pi}{2}=\left(\frac{2*2}{1*3}\right)*\left(\frac{4*4}{3*5}\right)*\left(\frac{6*6}{5*7}\right)*\left(\frac{8*8}{7*9}\right)*\ldots \quad (1).$$

T. Friedmann and C. R. Hagen found 460 years later a quantum mechanical derivation of equ. (1) [2,4] .

And what about the infinite products

$$\left(\frac{3*3}{1*5}\right)*\left(\frac{7*7}{5*9}\right)*\left(\frac{11*11}{9*13}\right)*\left(\frac{15*15}{13*17}\right)*\ldots=? \quad (2)$$

$$\left(\frac{4*4}{1*7}\right)*\left(\frac{10*10}{7*13}\right)*\left(\frac{16*16}{13*19}\right)*\left(\frac{22*22}{19*25}\right)*\ldots = ??$$

(3)

and more?

References

[1] Sondow, Jonathan and Weisstein, Eric W. "Wallis Formula." From *MathWorld*--A Wolfram Web Resource. http://mathworld.wolfram.com/WallisFormula.html

[2] https://en.wikipedia.org/wiki/Wallis_product

[3] https://de.wikipedia.org/wiki/Wallissches_Produkt

[4] T. Friedmann, C.R. Hagen. Quantum mechanical derivation of the Wallis formula for π. Journal of Mathematical Physics **56**, 112101 (2015); doi: http://dx.doi.org/10.1063/1.4930800

Wanted

Find a formula for the general term of the sequence

$\langle f(1),f(2),f(3),f(4),\ldots,f(n)\rangle$

with the difference quotient

$$df(n) = \frac{f(n)-f(n-1)}{f(n-1)-f(n-2)} = n\ .$$

Solution

f(n) = 1+2(1+3(1+4(1+5(1+...n(1)...))))

$$= \sum_{i=1}^{n} i!$$

$$= \begin{vmatrix} 1 & 1 & 1 & 1 & 1 & 1 & \cdots & 1 \\ -2 & 1 & 0 & 0 & 0 & 0 & \cdots & 0 \\ 0 & -3 & 1 & 0 & 0 & 0 & \cdots & 0 \\ 0 & 0 & -4 & 1 & 0 & 0 & \cdots & 0 \\ 0 & 0 & 0 & -5 & 1 & 0 & \ddots & 0 \\ 0 & 0 & 0 & 0 & -6 & 1 & \ddots & 0 \\ \vdots & \vdots & \vdots & \vdots & \ddots & \ddots & \ddots & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & -n & 1 \end{vmatrix}$$

Extend this problem & solution extensively.

References

[1] A. O. Gelfond: Differenzenrechnung.
Dt. Verlag d. Wiss., Berlin, 1958

[2] R.L. Graham, D.E. Knuth, O. Patashnik.
Concrete Mathematics.
Addison-Wesley 2008, ISBN 0-201-55802-5

[3] Weisstein, Eric W. "Recurrence Equation." From *MathWorld*--A Wolfram Web Resource. http://mathworld.wolfram.com/RecurrenceEquation.html

[4] https://de.wikipedia.org/wiki/Differenzenrechnung

Discuss the course of the functions

$$f_1(x) = 1 + \sum_{i=1}^{\infty} \frac{x^i}{\sum_{j=1}^{i} j!}$$

$$f_2(x) = \sum_{i=1}^{\infty} \frac{(-1)^{i-1} x^{2i-1}}{\sum_{j=1}^{2i-1} j!}$$

for $x \in \mathbb{R}$ and for $x \in \mathbb{C}$.

Draw the graphs of $f_1(x)$ and $f_2(x)$ for $x \in \mathbb{R}$.

Applications?

30.08.2017 EPSnoct.



Photo by Jonathan Stoschek „Late Summer“