Unit 15, part 75.2

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

Wort-Fundstücke, Gehörtes, Gelesenes, Zugelaufenes, Angeschwemmtes, …

Quer- denker
Out-of-the-box-
Weit-herholen-
Zusammen-
kreatives Denken
innovatives
realisierungsorientiertes
ergebnisorientiertes
mehr …

https://www.computerwoche.de/a/wie-erfolgsmenschen-denken,2508812
J. C. Maxwell. So denken Erfolgsmenschen: Die Beziehung zwischen Ihrem Kopf und Ihrer Lebensqualität.
Börsenmedien - books4success 2012 , ISBN-13: 978-3864700026
D. Eagleman, A. Brandt. Kreativität: Wie unser Denken die Welt immer wieder neu erschafft.
Siedler Verlag 2018 , ISBN-13: 978-3827500182

https://www.gruenderszene.de/karriere/produktivitaet-fokuszeiten-thomas-mangold

In passing

$\sum_{i=1}^{\infty} \frac{1}{i^2} = \frac{\pi^2}{6}$.

How about f(k) = $\sum_{i=1}^{\infty} \frac{1}{i^2+k} = \frac{m}{n}\pi^2$; $k, m, n \in \mathbb{N}$??

k	m	n
0	1	6
?	?	?

Irgendwann war das **arcanum** kein arcanum mehr:

** Seidenspinner/Seide/China(≈ 3000v.Chr. – 550n.Chr.)
** Glasprodukte/Murano(≈ 1300 – 1600)
** Lösungsformel für kubische Gleichungen/ Niccolò Tartaglia(1535-1539) [8]
** Europäisches Porzellan/Meißen(1710 – 1718)

……

Plantago lanceolata is a survival artist.

$\frac{S^3}{V^2}$ and MIN$\frac{S^3}{V^2}$ of solids

Reloaded and extended

We consider a right circular cylinder of radius r, high h, volume V, and total surface S, (see [1]),

a solid with two free parameters.
This cylinder generates π via

$$\pi = \frac{1}{54}\ \lim_{h \to 2r} \frac{S^3}{V^2} \qquad (1.1)$$

$$= \frac{1}{54}\ \left(\frac{S^3}{V^2} \to \mathrm{MIN}\right). \qquad (1.2)$$

Check the convergence of equs (1).
How we can accelerate the convergence?
Find similar geometric representations of e,
$\Phi = \frac{1}{2}(\sqrt{5} + 1)$, and other mathematical constants.

For comparision:
For the sphere with only one free parameter, the radius r, (see [2]) we have

$$\pi = \frac{1}{36}\ \frac{S^3}{V^2}\ . \qquad (2)$$

For the right circular cone with two free parameters, the radius r and the high h, (see [3]) we have

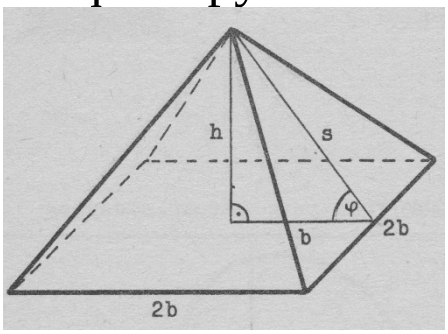
$$\pi = \frac{1}{72}\ \lim_{h \to 2\sqrt{2}r} \frac{S^3}{V^2} \qquad (3.1)$$

$$= \frac{1}{72}\ \left(\frac{S^3}{V^2} \to \mathrm{MIN}\right). \qquad (3.2)$$

And vice versa:

Solid	$\frac{S^3}{V^2}$. and MIN$\frac{S^3}{V^2}$..
Sphere.	36π = 113.0973355…
Right circular cylinder..	54π = 169.640033…
Right circular cone..	72π = 226.1946711…

Right square pyramid..



$h = 2\sqrt{2}b$ 288

Right square pyramid:

** cubeborn.

$h = 2b$ $72\left(\frac{\sqrt{5}+1}{2}\right)^3 = \frac{72}{\tau^3}$

$= 304.9968944\ldots$

** Johnson solid J_1. [4]

$h = \sqrt{2}b$ $18(1+\sqrt{3})^3$

$= 367.0614872\ldots$

** „Cheops“. [5]

$h = \frac{b}{\sqrt{\tau}}, \tau = \frac{1}{2}(\sqrt{5}-1)$ $36\tau(1+\frac{1}{\tau})^3$

$= 399.246118\ldots$

Platonic solids [6]:

Icosahedron. $270(7\sqrt{3}-3\sqrt{15})$

$= 136.4595159\ldots$

Dodecahedron. $54(25-11\sqrt{5})\sqrt{25+10\sqrt{5}}$

$= 149.(857)\text{per}$

Octahedron. $108\sqrt{3} = 187.0614872\ldots$

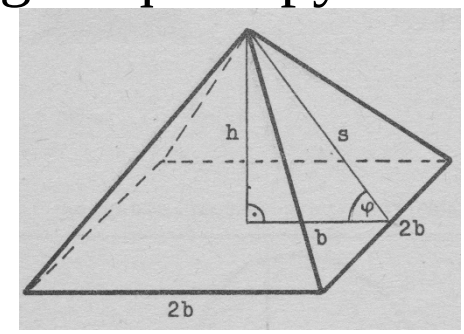
Cube. 216

Tetrahedron. $216\sqrt{3} = 374.1229744\ldots$

Continue this table and discuss the values of

$\frac{S^3}{V^2}$. and MIN$\frac{S^3}{V^2}$, esp. Archimedean solids [7].

Lateral 1
Right square pyramid

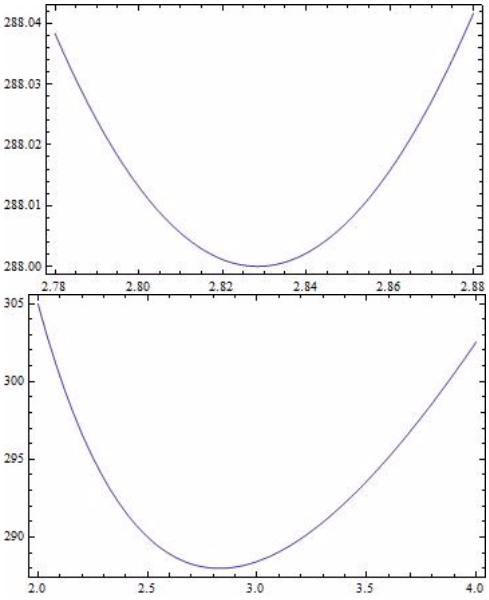


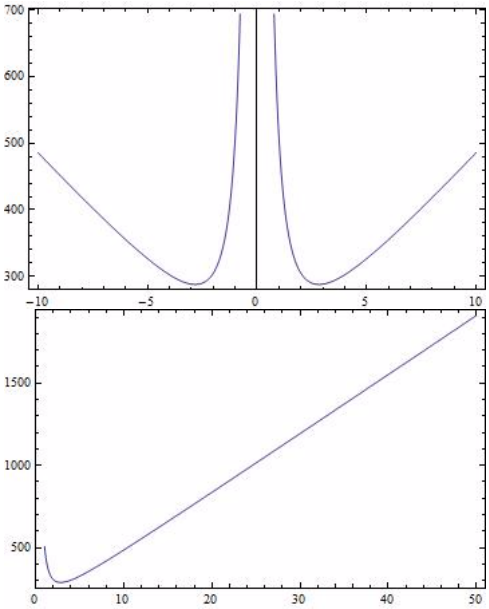
$$\frac{S^3}{V^2} = y \text{ , } \frac{h}{b} = x \qquad (4.1)$$

$$y = f(x) = 36\frac{(1+\sqrt{1+x^2})^3}{x^2} \qquad (4.2)$$

$$\lim_{x\to\infty} f'(x) = 36 \qquad (4.3)$$

Your turn: Curve sketching, incl. Graph.
DS Last minute





Lateral 2

For comparision: right circular cone [3]

$$\frac{S^3}{V^2} = y \text{ , } \frac{h}{r} = x \qquad (5.1)$$

$$y = f(x) = 9\pi \frac{(1+\sqrt{1+x^2})^3}{x^2} \qquad (5.2)$$

Lateral 3

We consider the functions

$$f(k) = \prod_{i=3}^{k} \frac{1+\sqrt{1+i^2}}{i} \qquad (6.1)$$

and

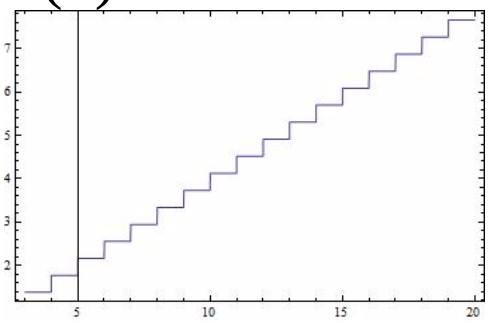
$$g(k) = f(k+1) - f(k) = f(k)*\frac{\sqrt{1+(k+1)^2}-k}{k+1} \qquad (6.2)$$

Your turn:

** Value tables of f(k) and g(k),

** Curve sketching, incl. Graphs,

f(k)



k

f(20)= 8.048601394791227159 91...

** esp. discussion of

$\lim_{k\to\infty} g(k) = 0.3924980414\ldots = ?$ (6.3)

Lateral 4

3D → 2D, regular n-polygon

$$\frac{\text{perimeter}^2}{\text{area}} = 4n*\tan\left(\frac{\pi}{n}\right) \qquad (7)$$

References

[1] Weisstein, Eric W. "Cylinder." From *MathWorld*--A Wolfram Web Resource. http://mathworld.wolfram.com/Cylinder.html

[2] Weisstein, Eric W. "Sphere." From *MathWorld*--A Wolfram Web Resource. http://mathworld.wolfram.com/Sphere.html

[3] Weisstein, Eric W. "Right Circular Cone." From MathWorld--A Wolfram Web Resource. http://mathworld.wolfram.com/RightCircularCone.html

[4] Weisstein, Eric W. "Square Pyramid." From *MathWorld*--A Wolfram Web Resource. http://mathworld.wolfram.com/SquarePyramid.html

[5] https://en.wikipedia.org/wiki/Great_Pyramid_of_Giza

[6] Weisstein, Eric W. "Platonic Solid." From *MathWorld*--A Wolfram Web Resource. http://mathworld.wolfram.com/PlatonicSolid.html

[7] Weisstein, Eric W. "Archimedean Solid." From *MathWorld*--A Wolfram Web Resource. http://mathworld.wolfram.com/ArchimedeanSolid.html

[8] https://de.wikipedia.org/wiki/Niccol%C3%B2_Tartaglia

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