[VA] SRC#002- Almost integers and other beasties

12-14-2018, 12:30 AM Post: #1

Valentin Albillo
Senior Member

Posts: 347
Joined: Feb 2015
Warning Level: 0%

[VA] SRC#002- Almost integers and other beasties

.
Hi all, welcome to my ***SRC#002 - Almost integers and other beasties***.

Here I'll show an assortment of the results I can get using my **HP-71B IDENTIFY** program version **2.0**. The original version 1.0 was extensively discussed and demonstrated with examples galore in my article ***Boldly Going ... Identifying Constants***, published more than 10 years ago. You can download it as a PDF document using this link:

Boldly Going ... Identifying Constants

Shortly after publishing it I expanded its already substantial capabilities with important additional features such as the ability to find *Minimal Polynomials* and other implicit expressions, which greatly increased the recognition of arbitrary constants, and further this version **2.0** can be used *creatively* to find **interesting, uncanny expressions** never before seen, like the following ones I found and which you might enjoy seeing and checking using your trusty *HP* calculator:

- if **x = Ln(1+π)** then $62x^2+123x$ = 300.000002
- if **x = Sin e** then $11x-9x^2$ = 2.9999227778868800
- if **x = Sin 4** then $5x(x-4)$ = 17.99979999
- if **x = Sin 1 + Cos 2 + Tan 3** then 6^3x-x^2 = 60.9999995
- if $x = \frac{3}{7}\sqrt[3]{\frac{261}{\pi}}$ then x^5-x = 21.0000000100
- if **x = 1% of Acos** $\frac{-317}{664}$ then $\sqrt{10}-x$ = 3.14159265358
- if $x^x = \pi$ then $(x+6)(9x-x^3)$ = 80.999999999
- if **x = Gamma** π then $38x^2-3x^3$ = 163.00000

- if **x** is the positive root of $.7x^2-6x-236 = 0$, then **Ln x =** 3.14159265

Go ahead, check them, and I'd love to see any and all comments you would have on the matter, as well as your own uncanny expressions of a similar nature (**Gerson**, I'm looking at you), please post your very best, original ones discovered by you (no 3rd-party ones harvested on the Internet, please) as replies in this thread.

Regards.
V.
.

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12-14-2018, 06:41 AM **Post: #2**

ttw
Member

Posts: 164
Joined: Jun 2014

RE: [VA] SRC#002- Almost integers and other beasties

The PDF had fonts the I couldn't read, but that doesn't stop me from commenting. (I is the internet.)

If interpreted your comments correctly, you compare by comparing fractions in lowest terms. This suggests (if you are not doing this already, converting decimals to continued fractions and do comparisons by generating a single partial quotient at each step. This could lead to a nice speedup as grossly different numbers could be eliminated quickly.

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12-14-2018, 05:14 PM **Post: #3**

Gerson W. Barbosa
Senior Member

Posts: 1,135
Joined: Dec 2013

RE: [VA] SRC#002- Almost integers and other beasties

> **Valentin Albillo Wrote:** (12-14-2018 12:30 AM)
>
> Go ahead, check them, and I'd love to see any and all comments you would have on the matter, as well as your own uncanny expressions of a similar nature (**Gerson**, I'm looking at you), please post your very best, original ones discovered by you (no 3rd-party ones harvested on the Internet, please) as replies in this thread.

Hello, Valentin,

More or less in the same vein,

- if $\mathbf{x} = \pi\sqrt{2}$ then $\left(12^2 - 5 \times 10^{-5}\right)^{\mathbf{x}+\mathbf{x}^{-1}} =$ 640.00000003

Here are a few more original near-integers and near-identities:

$$2\left(\pi + e - \psi\right) = 4.9999776$$

$$2\left(e - \tan^{-1}(e)\right) = 2.9999978$$

$$\ln\left(\frac{16 \ln 878}{\ln(16 \ln 878)}\right) = 3.14159265377$$

$$\frac{e^{\frac{23}{4}}}{100 + \frac{1}{100 + \frac{1}{\sqrt{100\sqrt{5}}}}} = 3.141592\,65354$$

$$3.141593 - \frac{\sqrt{3}}{5 \times 10^6} = 3.1415926535898$$

$$\frac{\ln\left(\sqrt{8} \cdot 10^8\right)}{\ln \pi} = 16.999994$$

$$\frac{\ln\left(2 \cdot \varphi^{39}\right)}{\ln \pi} = 17.00000026$$

Best regards,

Gerson

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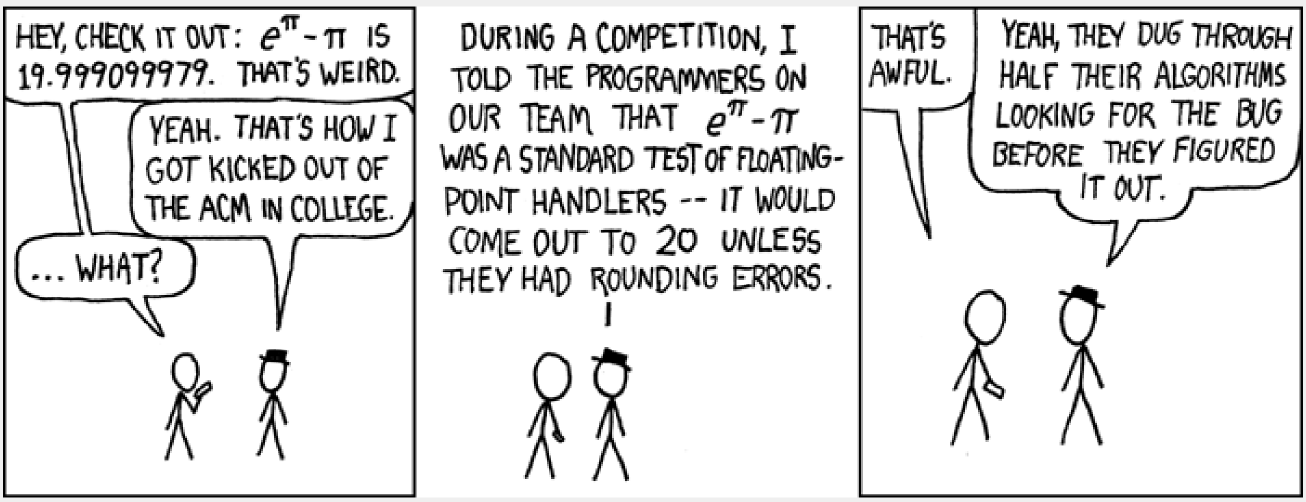
12-14-2018, 10:29 PM **Post: #4**

Thomas Klemm
Senior Member

Posts: 1,449
Joined: Dec 2013

RE: [VA] SRC#002- Almost integers and other beasties

> **Valentin Albillo Wrote:** (12-14-2018 12:30 AM)
> no 3rd-party ones harvested on the Internet, please



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12-14-2018, 10:58 PM **Post: #5**

rprosperi
Senior Member

Posts: 3,280
Joined: Dec 2013

RE: [VA] SRC#002- Almost integers and other beasties

> **Gerson W. Barbosa Wrote:** (12-14-2018 05:14 PM)
>
> $$\ln\left(\frac{16\ln 878}{\ln(16\ln 878)}\right) = 3.14159265377$$

There is something beautiful and compelling about this one, at least for me!

Both you guys truly amaze me... in a good way, just to be clear....

--Bob Prosperi

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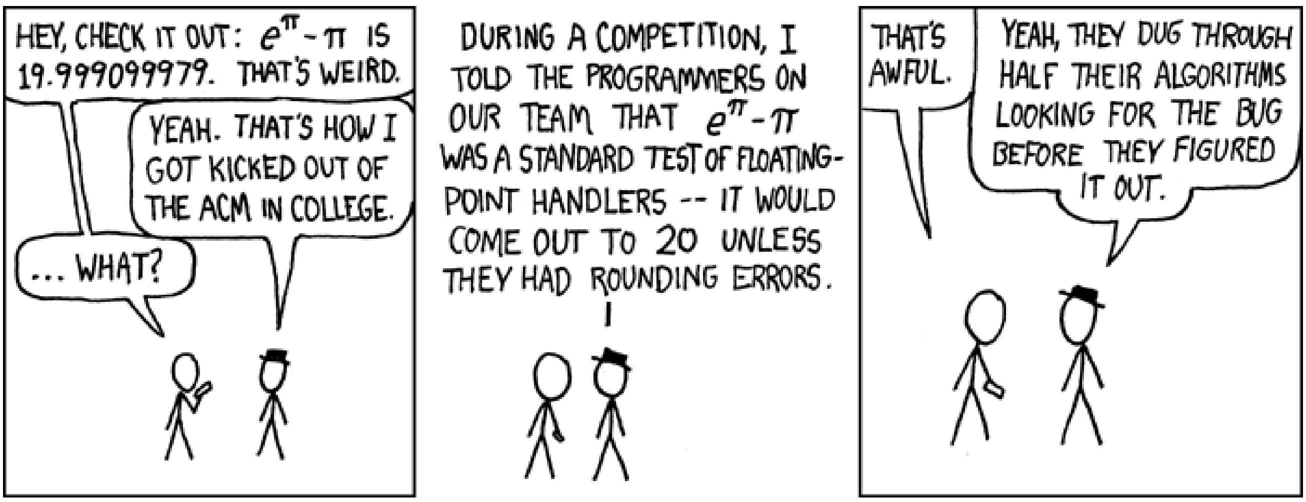
12-14-2018, 11:41 PM (This post was last modified: 12-14-2018 11:47 PM by Gerson W. Barbosa.) **Post: #6**

Gerson W. Barbosa
Senior Member

Posts: 1,135
Joined: Dec 2013

RE: [VA] SRC#002- Almost integers and other beasties

> **Thomas Klemm Wrote:** (12-14-2018 10:29 PM)
>
> > **Valentin Albillo Wrote:** (12-14-2018 12:30 AM)
> >
> > no 3rd-party ones harvested on the Internet, please
>
> 
>

I would humbly suggest an even more comprehensive test:

$$e^{\pi}-\pi+\left(\frac{9}{3\times10^{2}-\frac{2\sqrt{3}}{10^{3}-\ln(2+\sqrt{2})}}\right)^{2}=20.000000000000000$$

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12-15-2018, 02:19 AM **Post: #7**

Gerson W. Barbosa
Senior Member

Posts: 1,135
Joined: Dec 2013

RE: [VA] SRC#002- Almost integers and other beasties

Or this one, for 10-digit calculators:

$$\pi^2 + \frac{e^2}{33(\ln(\pi))^4} = 10.00000000$$

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12-15-2018, 11:20 PM **Post: #8**

Valentin Albillo
Senior Member

Posts: 347
Joined: Feb 2015
Warning Level: 0%

RE: [VA] SRC#002- Almost integers and other beasties

.
Hi, ttw:

> **ttw Wrote:** (12-14-2018 06:41 AM)
> This suggests (if you are not doing this already, converting decimals to continued fractions and do comparisons by generating a single partial quotient at each step.

Thanks for your interest and comment. I do use a continued fraction algorithm to convert the arbitrary constant supplied by the user to a rational fraction, generating partial quotients one by one till the user-supplied accuracy is met.

Regards.
V.
.

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12-15-2018, 11:56 PM (This post was last modified: 12-16-2018 05:48 AM by Valentin Albillo.) **Post: #9**

Valentin Albillo
Senior Member

Posts: 347
Joined: Feb 2015
Warning Level: 0%

RE: [VA] SRC#002- Almost integers and other beasties

.
Hi, Gerson:

> **Gerson W. Barbosa Wrote:** (12-14-2018 05:14 PM)
> More or less in the same vein,

Thanks for your excellent findings, I was sure you'd never fail to contribute some amazing near-identities to this thread. As **Bob Prosperi** already pointed out, I too find this one particularly **beautiful**:

> **Quote:**
>
> $$\ln\left(\frac{16\ln 878}{\ln(16\ln 878)}\right) = 3.14159265377$$

Good finding indeed !

By the way, it's quite nice that the simple function **x/Ln(x)** sometimes gives *almost-integer* results for integer arguments (which means its graphic passes *extremely close* to integer-coordinates grid points), such as the following, in increasing order of *"closeness"*:

```
x                    x/Ln(x)
```

```
 ---------------------------------
    17              6.0002541...
    163            31.9999987...
    53453        4910.0000012...
    110673       9529.0000006...
    715533      53078.0000004...
```

so that we have, for instance,

53453/Ln(53453) = 4910.0000012...

In your case the argument **x=16*Ln(878)** results in **x/Ln(x)** being **23,14069263**69... which is almost the famous **Gelfond's constant = e^Pi** (the easiest transcendental number to compute to high precision) so its natural logarithm is very nearly **Pi** itself.

Nice catch !

Have a fine weekend and best regards
V.
.

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12-16-2018, 11:06 AM **Post: #10**

EdS2
Member

Posts: 126
Joined: Apr 2014

RE: [VA] SRC#002- Almost integers and other beasties

.

> **Valentin Albillo Wrote:** (12-15-2018 11:56 PM)
>
> By the way, it's quite nice that the simple function **x/Ln(x)** sometimes gives *almost-integer* results for integer arguments...

Thanks, that leads to a rabbit hole of interesting links (OEIS and Mathoverflow.)

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12-16-2018, 05:51 PM **Post: #11**

ttw
Member

Posts: 164
Joined: Jun 2014

RE: [VA] SRC#002- Almost integers and other beasties

Exp(Pi*Sqrt(163)) is one of the classic examples. The explanation is rather complicated. Other expressions, for example:
({[Sqrt(5)+1]/2}^n)/Sqrt(5) is close to the Fibonacci numbers; in fact ({[Sqrt(5)+1]/2}^n-{[1-Sqrt(5)]/2}^n)/Sqrt(5) is the well-known Binet formula for Fibonacci numbers. This sequence works by successive approximation to an integer the 163 sequence just seems to happen.

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12-17-2018, 12:43 AM **Post: #12**

Valentin Albillo
Senior Member

Posts: 347
Joined: Feb 2015
Warning Level: 0%

RE: [VA] SRC#002- Almost integers and other beasties

> **EdS2 Wrote:** (12-16-2018 11:06 AM)
>
> Thanks, that leads to a rabbit hole of interesting links (OEIS and Mathoverflow.)

Interesting. I did not consult the **OEIS** for the results I gave above for **x/Ln(x)**, I simply obtained them myself by running this trivial **HP-71B** program I wrote in J-F Garnier's **Emu71** to quickly find them:

```
1  DESTROY ALL @ M=1 @ I=2
2  X=I/LN(I) @ N=ABS(X-IROUND(X)) @ IF N<M THEN M=N @ DISP I;,X
3  I=I+1 @ GOTO 2

>RUN

2   2.88539008178
5   3.10667467281
9   4.09607651981
13   5.06832618827
17   6.00025410569
163   31.9999987385
53453   4910.00000122
110673   9529.00000068
715533   53078.0000004
1432276   101044
...       ...
```

Substituting **X=I/LN(I)** at line *2* by some other function and rerunning the program will result in a new set of almost-integer values, for instance:

```
2 X=I/TAN(I) ...

>RUN

 2   -.915315108721
 3   -21.0457576543
 7   8.03260795684
 37   -44.0072133321
 48   39.9957590124
 128   -123.004197859
 170   460.0010337
 1489   -12899.9995967
 2106   986.000155144
 11923   15493.9999873
```

i.e.: **1489/Tan(1489) =** -12899.9995967 ~ **-12900**

and so on and so forth. Trivial variations of this trivial program will produce an infinitude of almost-integer valued expressions of all kinds.

Thanks for your interest and links.

V.
.

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12-20-2018, 12:23 AM (This post was last modified: 12-20-2018 11:56 PM by Valentin Albillo.) **Post: #13**

Valentin Albillo
Senior Member

Posts: 347
Joined: Feb 2015
Warning Level: 0%

RE: [VA] SRC#002- Almost integers and other beasties

.
Hi, all:

> **I Wrote:** ⇨ (12-17-2018 12:43 AM)
>
> Trivial variations of this trivial program will produce an infinitude of almost-integer valued expressions of all kinds.

A few additional, nice *almost-integer* results obtained that way:

```
5e^Acos(178/181)    = 6.0000000066

9e^Acos(538/541)    = 10.0000000023

8e^Acos(430/433)    = 9.0000000048

Ln 146 + Sin 614    = 4.0000080014

Ln 455 + Cos 188    = 7.0000034

Ln 231 + Tan 87     = 4.0000023

Gamma(314/709)      = 2.0000047
```

All trig functions, in radians.

V.
.

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01-03-2019, 01:45 AM **Post: #14**

Gerson W. Barbosa
Senior Member

Posts: 1,135
Joined: Dec 2013

RE: [VA] SRC#002- Almost integers and other beasties

640000*x^5-768000*φ^2*x^4+3000+ln(2)=0

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01-03-2019, 08:29 AM **Post: #15**

Valentin Albillo
Senior Member

Posts: 347
Joined: Feb 2015
Warning Level: 0%

RE: [VA] SRC#002- Almost integers and other beasties

.
Hi, **Gerson**:

> **Gerson W. Barbosa Wrote:** ⇨ (01-03-2019 01:45 AM)
>
> 640000*x^5-768000*φ^2*x^4+3000+ln(2)=0

I only have an iPad at hand right now so running this *extremely* quick'n'dirty Newton on it produces the intended root of your polynomial, namely:

```
10 def fnf(x)=640000*x^5-768000*p^2*x^4+3000+log(2)
20 def fnd(x)=(fnf(x+0.0001)-fnf(x-0.0001))/0.0002
30 p=(1+sqr(5))/2:input x0:home
35 for i=1 to 15
40 x1=x0-fnf(x0)/fnd(x0)
```

```
50 print x1;" ";fnf(x1)
60 x0=x1
70 next i
```

Run

```
?10
8.167851990851785 14317006965.841368
6.715802401810718 4653139559.305097
5.573461555087618 1501801189.590903
4.687642795302511 477761112.5232644
4.021032838991736 147136983.11165047
3.551962197641171 41803117.36241603
3.2712995361031516 9506051.502593396
3.1593486482128053 1132110.8530623894
3.141983056899174 24349.060661761047
3.141592847539331 12.090443311217141
3.1415926535896097 0.0000030975368739971643
3.14159265358956 -3.170697671084355e-8
3.1415926535895604 -1.904654323148236e-9
3.1415926535895604 -1.904654323148236e-9
```

3.1415926535895604 -1.904654323148236e-9

which is a nice approximation to Pi, congrats and thanks for sharing. Perhaps it's even more accurate than what the iPad produces but right now I can't tell ...

Regards.
V
.

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01-03-2019, 08:48 AM (This post was last modified: 01-03-2019 08:49 AM by Paul Dale.) **Post: #16**

Paul Dale
Senior Member

Posts: 1,455
Joined: Dec 2013

RE: [VA] SRC#002- Almost integers and other beasties

The underline finishes one digit too far:

> **Valentin Albillo Wrote:** (01-03-2019 08:29 AM)
> **3.1415926535895604** -1.904654323148236e-9

3.1415926535897932

Learning some leading digits of π is useful (for trolling).

Pauli

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01-03-2019, 09:36 AM **Post: #17**

Valentin Albillo
Senior Member

Posts: 347
Joined: Feb 2015
Warning Level: 0%

RE: [VA] SRC#002- Almost integers and other beasties

> **Paul Dale Wrote:** (01-03-2019 08:48 AM)
> The underline finishes one digit too far:

Nope, it ends exactly where I intended it to end.

And yes, you are trolling.

V.
.

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01-03-2019, 01:56 PM **Post: #18**

Gerson W. Barbosa
Senior Member

Posts: 1,135
Joined: Dec 2013

RE: [VA] SRC#002- Almost integers and other beasties

> **Paul Dale Wrote:** (01-03-2019 08:48 AM)
>
> **3.1415926535897932**
>
> Learning some leading digits of π is useful (for trolling).
>
> Pauli

Or for spotting mistakes like this one (YouTube video).
I used to remember the first 16 digits when I used my HP-200LX on a regular basis (its screen has gone dark and I have no spare part to replace it again). Anyway, I don't remember any "747" sequence occurring so early in π.

Gerson.

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01-03-2019, 02:51 PM **Post: #19**

Paul Dale
Senior Member

Posts: 1,455
Joined: Dec 2013

RE: [VA] SRC#002- Almost integers and other beasties

The first "747" occurs at position 740 (thanks to the π searcher).

In the fullness of π, this is right near the start (of course).

Pauli

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01-04-2019, 12:33 AM **Post: #20**

Valentin Albillo
Senior Member

Posts: 347
Joined: Feb 2015
Warning Level: 0%

RE: [VA] SRC#002- Almost integers and other beasties

> **I Wrote:** (12-20-2018 12:23 AM)
>
> A few additional, nice *almost-integer* results obtained that way:

For completeness, I forgot to include this remarkable one which I discovered and posted here last

March:

```
Sin(9*(Sin 1 + Cos 40)) = 0.99999999999999830826985368...
```

which differs from the integer **1** by about *1e-16.*

V.

.