
PRIMES OF THE FORM $3^k \cdot k^3 + 2$ (EXTENDED DATASET)

Numerical Data produced by the sequence of primes of the form $a(n) = 3^n \cdot n^3 + 2$. Evaluated in the range of: $0 \leq n \leq 10000 / n \in \mathbb{Z}$.

Details

This integer sequence was registered and published in the On-Line Encyclopedia of Integer Sequences (OEIS.org) Database on October 08 - 2024, under the OEIS code: A376895.

This sequence can be expressed with the help of a general formula that uses the sequence A366997 which are the integers n such that $a(n) = 3^n \cdot n^3 + 2$ is a prime number. This general formula is such that:

General Formula

$$a(n) = 3^{A366997} \cdot A366997^3 + 2.$$

(1)

Some interesting properties of this sequence are:

- The next term $a(8) = \sim 2.20847 \times 10^{143}$ is too large to include in the standard OEIS format.
- $a(9) = \sim 8.66244 \times 10^{153}$.
- $a(10) = \sim 9.21872 \times 10^{433}$.
- This sequence is constituted by primes of the forms A002145 and A002144, with the exception of 2.
- The last known integer k in A366997 is 20803 and corresponds to $a(13) = \sim 3.21988 \times 10^{9938}$.

About the Code

About the Mathematica code utilized for reproducing the data on the On-Line Encyclopedia of Integer Sequences, we utilized the following code:

```
Select[Table[3^k*k^3+2, {k, 0, 1000}], PrimeQ]
```

The previous code executed in 0.134384 seconds (Wolfram Cloud) and 0.171601 seconds (Personal Computer).

The execution times were measured using the Mathematica function “**Timing[]**”.

The dataset reported on this notebook was generated by the following Mathematica program:

```
Select[Table[3^k*k^3+2, {k, 0, 10000}], PrimeQ]
```

Exceeded base plan execution time in Wolfram Cloud. On other side, 718.01s were necessary to

execute this code (Personal Computer).

Data Definitions

Mathematica code that computes the sequence of prime numbers of the form $a(n) = 3^n * n^3 + 2$ (A376895) for non-negative integers n such that $n \leq 10000$.

```
In[ ]:= DSA376895 = Select[Table[3^k * k^3 + 2, {k, 0, 10000}], PrimeQ]
(* The extended Dataset *)
```

Mathematica plot code demonstrating the behavior of the sequence when evaluated for a non-negative integer n such that $n \leq 170$ (Just like the published data in the OEIS).

```
In[ ]:= PLOTA376895 = ListPlot[Select[Table[3^k * k^3 + 2, {k, 0, 170}], PrimeQ],
PlotLabel -> HoldForm[A376985], Joined -> True,
AxesLabel -> {"n", "p = 3^n * n^3 + 2"}, LabelStyle -> Directive[Black, Bold]]
```

Note: The last code is designed to plot the data within the same ranges that were previously published in the OEIS database, primarily for the purpose of facilitating time calculations. Should the intention be to plot the entirety of the dataset displayed in this notebook, it is recommended that the values in {k, 0, 170} be replaced with {k, 0, 10000}.

Primary Content

Warning: To accurately reproduce the following Data and Plot, execute all Input code lines stated in the Data Definitions prior.

```
In[ ]:= DSA376895
```

```
Out[ ]:= {2, 5, 14 348 909, 3 502 727 633, 150 094 635 296 999 123, 269 211 745 384 444 720 788 843 377,
2 075 640 621 314 051 693 456 929 619 860 436 129 299 430 333 182 575 810 508 680 776 710 025 092 954 \
370 975 575 949,
220 847 341 205 998 801 119 151 801 849 533 569 863 346 657 553 281 896 945 729 305 733 734 542 414 \
037 062 994 028 409 085 361 886 122 356 496 953 109 950 384 816 443 366 723 659 662 537 377,
8 662 441 712 540 038 408 951 314 465 509 496 761 663 924 929 545 157 124 622 810 167 082 940 687 295 \
523 808 477 754 379 640 867 360 318 811 157 238 517 693 922 380 063 481 815 382 500 267 002 005 632 \
843,
92 187 294 029 044 193 280 067 871 797 385 749 412 570 354 769 677 756 579 202 125 305 770 357 213 \
981 395 992 417 594 484 188 615 505 616 747 392 283 493 644 837 664 924 699 578 678 350 063 804 480 \
307 410 893 136 475 157 251 526 655 169 698 737 691 770 207 250 086 647 678 942 777 330 670 618 214 \
402 124 526 860 904 721 191 557 277 552 534 562 790 186 239 689 394 307 189 071 875 334 344 344 640 \
916 392 684 250 492 325 702 444 800 575 433 538 732 692 305 038 336 016 670 309 753 039 238 193 105 \
524 664 164 564 611 911 710 194 323 541 262 079 939 413 047 075 052 451 061 939,
30 810 898 517 527 917 947 487 467 749 900 662 329 535 693 595 032 169 027 081 638 274 754 977 542 \
253 783 381 276 094 589 268 548 012 067 358 385 635 578 927 206 938 230 693 597 503 035 087 698 089 \
814 806 414 127 210 095 355 869 157 201 999 076 122 275 813 017 377 813 651 345 764 656 742 191 655 \
```

066 410 177 453 708 942 954 726 965 106 993 513 787 912 570 580 543 519 178 046 478 187 722 530 782
 207 326 180 955 693 235 984 273 081 525 353 441 927 917 332 923 660 374 540 304 295 969 103 669 693
 173 579 834 003 950 764 008 988 278 746 649 835 538 422 215 676 625 906 045 957 550 406 853 171 355
 998 236 461 270 264 813 497 538 395 575 272 435 320 014 145 618 405 979 270 228 136 810 965 047 535
 391 028 344 090 881 616 667 747 375 149 080 459 480 076 846 188 536 939 616 309 782 539 339 282 930
 384 235 283 815 114 138 931 693 406 806 521 915 067 509 683 345 433 109 147 099 824 016 700 846 621
 763 281 344 440 566 030 515 391 807 677 357 898 787 008 118 154 280 690 136 120 459 795 798 258 866
 406 192 001 180 999 361 742 358 971 630 237 608 810 329 213 393 709 739 988 301 346 513 754 291 728
 344 364 526 252 470 299 785 538 019 522 631 567 638 063 073 244 170 268 593 581 393 166 769 613 981
 975 952 813 595 580 204 387 468 419 490 222 482 645 739 213 400 679 513 505 692 833 187 593 433 563
 449 922 415 839 057 307 872 949 133 909 309 192 667 114 553 660 258 521 443 134 138 823 293 547 846
 412 385 475 126 230 344 155 109 169 237 748 985 819 630 578 915 993 315 824 458 364 345 482 091 070
 429 058 418 156 373 827 009 229 211 157 654 758 395 663 553 122 167 288 748 726 597 790 291 501 120
 249 650 660 305 963 861 943 344 675 871 700 252 458 814 305 526 809 550 722 766 115 680 370 660 439
 322 985 978 932 174 858 531 479 897 542 579 589 027 658 238 339 476 293 561 325 547 233 972 424 672
 377 480 531 868 709 252 879 390 162 209 166 733 317 920 236 301 538 027 253 885 735 177 609 801 754
 660 775 128 381 005 304 150 479 897 422 811 825 743 558 747 411 706 788 946 507 583 534 226 779 201
 376 796 972 641 387 884 341 550 368 831 003 736 099 356 107 455 597 020 213 929 336 312 470 128 960
 658 271 353 973 829 236 474 365 922 323 309 459 348 588 469 765 743 325 101 987 614 682 572 235 745
 962 554 774 549 763 494 456 827 895 839 869 096 193 751 249 633 217 883 881 123 925 600 459 429 884
 823 805 558 577 832 557 584 278 926 189 402 824 192 176 635 116 736 170 661 618 805 955 764 438 257
 418 040 090 296 006 954 676 205 871 325 131 542 095 607 485 233 849 631 520 826 210 137 808 064 082
 873 200 064 651 915 178 173 896 266 612 871 333 248 831 027 667 142 238 267 298 865 091 027 802 023
 477 820 588 149 141 688 631 932 769 946 476 826 350 544 809 571 703 147 166 905 775 821 231 197 080
 975 925 204 421 930 512 222 909 782 262 052 580 814 903 209 829 722 610 860 457 397 128 424 187 121
 058 458 659 349 689 215 739 096 298 304 247 505 252 055 018 924 407 403 833 273 734 682 524 876 246
 855 877,
 331 744 494 323 508 586 752 315 527 438 344 311 106 382 656 231 332 526 413 471 631 734 415 927 862
 745 577 253 154 825 275 874 166 909 661 505 401 080 572 415 040 320 736 755 921 258 345 227 354 193
 518 600 343 153 535 291 585 159 059 150 475 098 011 152 350 625 951 887 265 814 819 425 328 414 390
 649 468 180 567 052 458 322 867 067 943 628 241 649 118 662 667 093 571 913 084 561 382 613 589 289
 465 488 415 543 234 656 735 362 218 578 521 380 495 947 660 718 640 813 443 391 579 421 062 811 288
 124 881 208 055 398 348 258 856 691 210 692 568 483 757 534 486 834 610 236 841 460 715 512 531 885
 332 225 713 482 481 037 466 464 836 206 315 320 192 343 201 722 568 799 991 768 372 801 162 608 715
 272 308 147 419 100 143 467 187 051 479 039 176 919 048 256 545 433 312 259 135 468 005 404 769 923
 663 525 942 148 596 262 213 496 625 462 377 910 375 089 738 065 597 938 744 304 424 673 448 024 594
 142 793 582 586 999 473 942 429 828 900 288 453 569 910 611 846 635 522 084 471 669 988 012 405 392
 336 146 331 865 296 967 381 829 335 534 568 199 077 551 933 626 904 153 387 443 264 834 111 125 097
 136 850 779 826 047 883 881 035 857 103 099 595 159 173 660 052 028 291 452 403 479 613 028 787 418
 918 654 278 067 122 791 469 696 584 559 093 897 654 930 322 331 520 201 720 613 587 971 565 429 482
 411 091 935 519 782 368 425 658 840 499 989 707 151 382 389 105 283 352 524 764 905 456 192 908 247
 549 958 794 404 045 380 002 686 656 684 549 723 157 333 412 511 798 257 551 538 754 101 030 221 338
 315 383 551 940 400 423 263 723 686 204 940 975 049 755 321 504 712 276 717 174 513 137 803 329 765
 941 164 604 470 725 328 590 254 537 627 122 066 044 123 992 941 232 519 172 426 115 357 121 707 548
 621 937 938 938 273 509 987 814 546 561 223 044 049 899 118 371 478 951 227 933 795 120 754 955 581
 811 496 140 695 231 757 979 188 697 129 695 308 509 134 158 803 874 683 755 938 302 628 678 640 548
 425 607 769 614 234 492 857 595 181 834 570 962 708 068 766 791 447 613 415 444 186 103 332 540 811
 600 432 517 398 023 852 189 774 182 902 074 962 620 055 669 876 998 573 073 628 829 878 126 865 376
 764 570 265 602 167 405 188 178 374 931 477 973 303 627 748 033 696 187 340 050 618 274 936 433 604
 227 483 111 640 657 115 354 950 129 486 755 974 458 576 167 776 445 889 645 818 160 843 545 021 375
 397 566 192 313 250 528 020 886 328 201 280 708 882 559 374 993 592 132 013 692 223 789 767 978 566
 715 302 045 279 557 121 503 770 188 746 557 935 517 611 140 465 631 400 642 418 011 462 307 158 719
 106 906 066 635 520 848 083 200 165 836 319 756 588 350 646 287 921 453 693 713 430 675 507 822 259
 952 190 893 686 889 922 647 440 504 528 416 669 302 462 870 703 912 511 353 234 055 287 843 844 913
 380 601 484 852 428 106 620 913 182 167 974 426 758 842 234 746 148 637 938 426 583 872 818 037 210

```

024 124 881 582 047 658 165 692 572 143 483 451 647 794 404 775 236 212 980 997 442 014 848 277 286 \
522 933 622 822 160 358 386 481 222 621 370 878 351 959 775 683 198 632 883 141 193 796 529 016 529 \
535 476 492 662 785 226 687 579 252 096 131 972 021 591 476 295 791 706 198 734 046 197 174 859 762 \
211 857 735 997 226 388 725 267 611 170 811 892 314 426 862 339 906 831 285 196 392 054 920 131 624 \
439 467 574 641 107 563 100 031 352 220 127 070 343 856 710 059 456 668 572 892 368 444 279 608 518 \
581 234 501 130 658 787 602 200 070 067 779 530 696 766 313 271 101 856 670 635 361 328 985 332 792 \
289 641 075 861 793 328 482 464 639 124 232 818 059 502 957 491 630 342 205 131 446 502 074 921 634 \
314 825 028 517 896 373 564 452 428 145 645 898 551 631 530 131 876 868 977 537 158 310 717 883 929 \
900 607 170 567 296 554 713 887 631 594 962 455 356 678 118 322 164 056 368 871 382 730 930 359 748 \
222 200 143 977 958 272 725 185 998 521 579 309 113 281 028 221 850 924 762 904 006 959 762 908 402 \
130 575 437 484 239 900 815 914 795 169 317 941 772 559 733 531 614 854 754 496 587 827 078 466 558 \
744 351 188 657 621 788 507 181 094 772 056 858 923 782 910 820 332 367 949 059 518 644 468 493 928 \
158 736 821 024 568 733 473 216 289 449 792 710 969 636 687 030 453 344 314 449 213 451 371 983 524 \
601 487 736 197 773 525 962 473 899 683 749 899 799 294 489 471 978 152 827 130 216 952 865 518 094 \
895 657 436 883 419 205 119 713 012 240 593 453 402 175 222 394 396 523 054 836 380 750 177 829 424 \
035 453 463 786 326 828 201 133 176 535 970 655 430 520 056 805 921 332 379 620 290 402 633 821 423 \
857 414 558 589 350 781 502 046 755 086 399 973 141 085 202 563 316 414 997 630 424 406 387 069 901 \
961 116 268 516 734 895 580 639 894 613 056 142 194 641 889 779 020 466 980 717 897 951 169 542 707 \
681 982 305 450 053 419 743 262 111 039 874 327 603 698 277 336 742 195 046 127 414 707 398 939 187 \
229 998 861 190 186 899 732 418 469 188 636 942 813 620 678 117 494 285 354 968 343 242 794 033 110 \
317 114 861 927 556 097 587 096 370 468 346 045 736 973 220 379 572 296 800 541 297 023 604 455 348 \
968 410 020 133 201 661 560 541 048 942 786 812 272 021 453 312 107 301 979 011 830 568 484 256 572 \
197 719 435 705 209 900 867 588 371 278 935 742 859 679 645 493 509 257 925 560 755 520 774 830 744 \
522 875 724 904 929 952 448 030 937 421 381 206 993 977 457 727 007 426 562 818 971 772 586 656 401 \
738 859 688 607 295 956 921 877 048 529 915 040 336 322 624 110 357 508 281 549 886 685 569 494 148 \
415 594 518 864 476 183 983 023 295 919 578 338 633 442 006 914 803 122 644 562 417 721 356 538 481 \
185 804 587 984 706 766 342 082 426 838 795 343 529 462 520 015 569 616 438 170 195 076 128 334 403 \
748 655 363 550 426 045 071 831 133 182 981 626 566 847 551 417 553 593 038 179 543 182 386 372 815 \
924 849 718 612 952 426 209 517 689 687 953 786 875 655 883 312 463 884 905 304 033 298 891 770 151 \
617 004 549 473 640 212 784 484 157 209 076 456 482 374 243 039 447 892 353 747 396 666 451 614 367 \
024 574 310 556 890 391 053 260 521 501 273 012 793}

```

Examples

For easier manipulation of the data, the contents of dataset **DSA376895** can be expressed in scientific notation.

```
In[ ]:= DSA376895 // N
```

```
Out[ ]:= {2., 5., 1.43489 × 107, 3.50273 × 109, 1.50095 × 1017,
2.69212 × 1026, 2.07564 × 1087, 2.20847 × 10143, 8.66244 × 10153,
9.21872940290442 × 10433, 3.081089851752792 × 102179, 3.317444943235086 × 104388}
```

The calculation of the additive digital root of prime numbers of the form $3^n \star n^3 + 2$ can be done as follows:

```
In[ ]:= Mod[DSA376895, 9, 1]
```

```
Out[ ]:= {2, 5, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2}
```

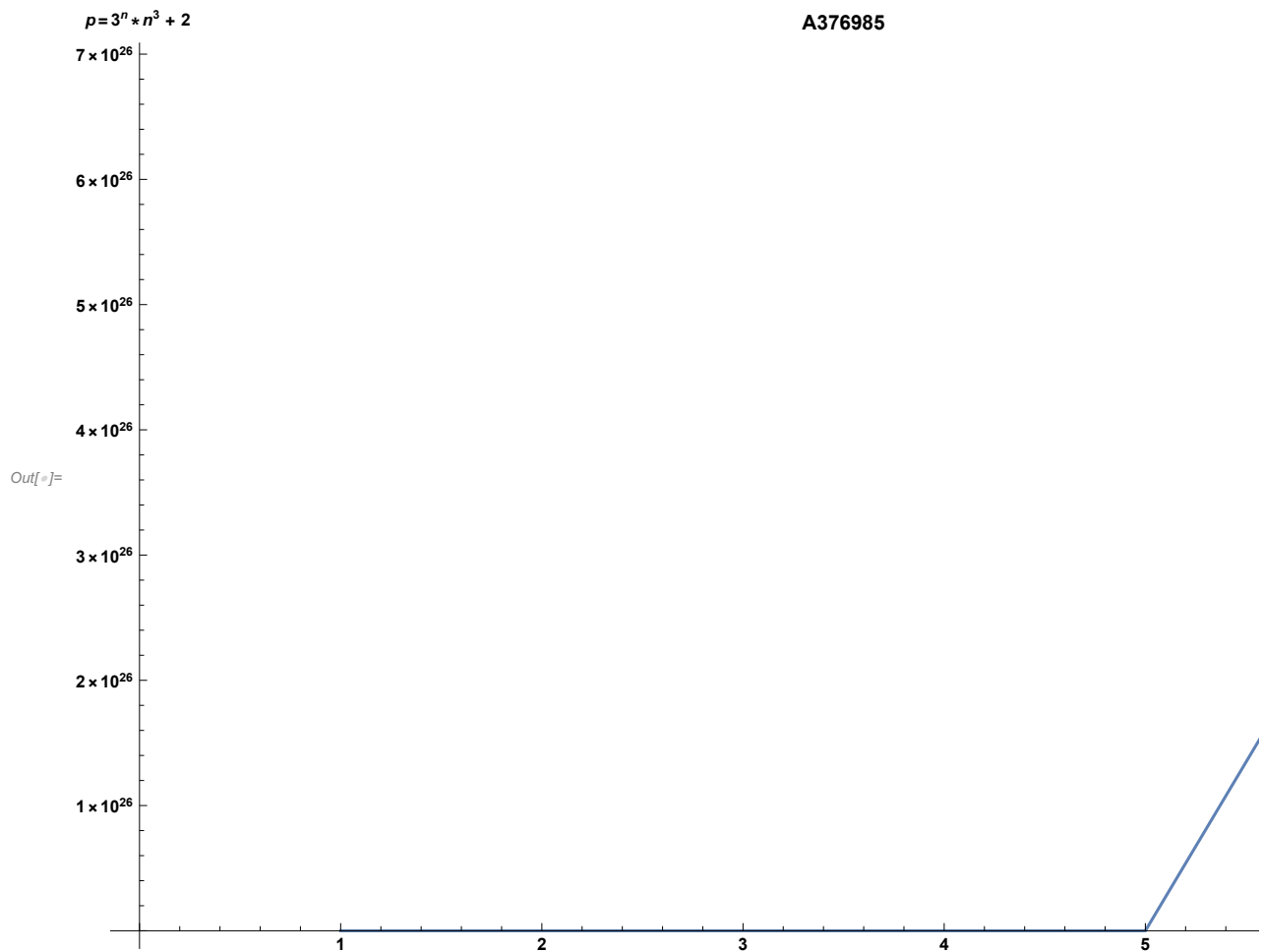
The term **a(13)** of the sequence A376895 was calculated using the general formula **(1)** as follows:

```
In[ ]:= 3^20803 * 20803^3 + 2 // N
```

```
Out[ ]:= 3.219881140655294 × 109938
```

Plot of the data displayed in the OEIS (A376895):

In[]:= **PLOTA376895**



Source & Additional Information

Submitted By

Paul F. Marrero Romero

Source/Reference Citation

Paul F. Marrero Romero, Primes of the form $3^k * k^3 + 2$, Entry A376895 in The On-Line Encyclopedia of Integer Sequences, <https://oeis.org/A376895>

Detailed Source Information

Author/Creator

Paul F. Marrero Romero

Source Title

Primes of the form $3^k k^3 + 2$.

Source Date

October 08 - 2024.

Source Publisher

<https://oeis.org/A376895>

Geographic Coverage

Worldwide

Source Language

English

Links

- Integer sequence: A002145
- Integer sequence: A002144
- Integer sequence: A366997

Keywords

- Sequences
- Mathematica
- Integer sequences
- OEIS
- Discrete Mathematics
- Prime Numbers
- Algorithm

Categories

<input type="checkbox"/> Agriculture	<input type="checkbox"/> Astronomy	<input type="checkbox"/> Chemistry	<input checked="" type="checkbox"/> Computational Universe
<input type="checkbox"/> Computer Systems	<input type="checkbox"/> Culture	<input type="checkbox"/> Demographics	<input type="checkbox"/> Earth Science
<input type="checkbox"/> Economics	<input checked="" type="checkbox"/> Education	<input type="checkbox"/> Engineering	<input type="checkbox"/> Geography
<input type="checkbox"/> Geometry Data	<input type="checkbox"/> Government	<input type="checkbox"/> Graphics	<input type="checkbox"/> Health
<input type="checkbox"/> Healthcare	<input type="checkbox"/> History	<input type="checkbox"/> Human Activities	<input checked="" type="checkbox"/> Images
<input type="checkbox"/> Language	<input type="checkbox"/> Life Science	<input type="checkbox"/> Machine Learning	<input type="checkbox"/> Manufacturing
<input checked="" type="checkbox"/> Mathematics	<input type="checkbox"/> Medicine	<input type="checkbox"/> Meteorology	<input type="checkbox"/> Physical Sciences
<input type="checkbox"/> Politics	<input type="checkbox"/> Reference	<input type="checkbox"/> Social Media	<input type="checkbox"/> Sociology
<input type="checkbox"/> Statistics	<input type="checkbox"/> Text & Literature	<input type="checkbox"/> Transportation	

Content Types

<input type="checkbox"/> Audio	<input type="checkbox"/> Entity Store	<input type="checkbox"/> Geospatial Data
<input checked="" type="checkbox"/> Graphs	<input type="checkbox"/> Image	<input checked="" type="checkbox"/> Numerical Data
<input checked="" type="checkbox"/> Text	<input type="checkbox"/> Time Series	<input type="checkbox"/> Video

Author Notes

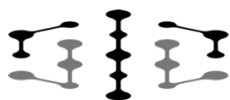
This sequence is currently under our study, and it is our intention to publish a corresponding paper discussing its algebraic properties and other aspects of the corresponding mathematics. The sequence is the result of some of the research projects that we are conducting in the field of discrete mathematics in Marrero Research Lab.

Personal Computer specs:

- Intel(R) Core(TM) i3-4005U CPU @ 1.70GHz 1.70 GHz
- 6,00 GB Ram - DDR4
- SO: Windows 10 x64 Professional.

My Orcid: 0000-0003-4219-2074

E-mail: paulqed0@protonmail.com
: pmarrero@uc.edu.ve



Marrero Research
Advancing Mathematical Knowledge