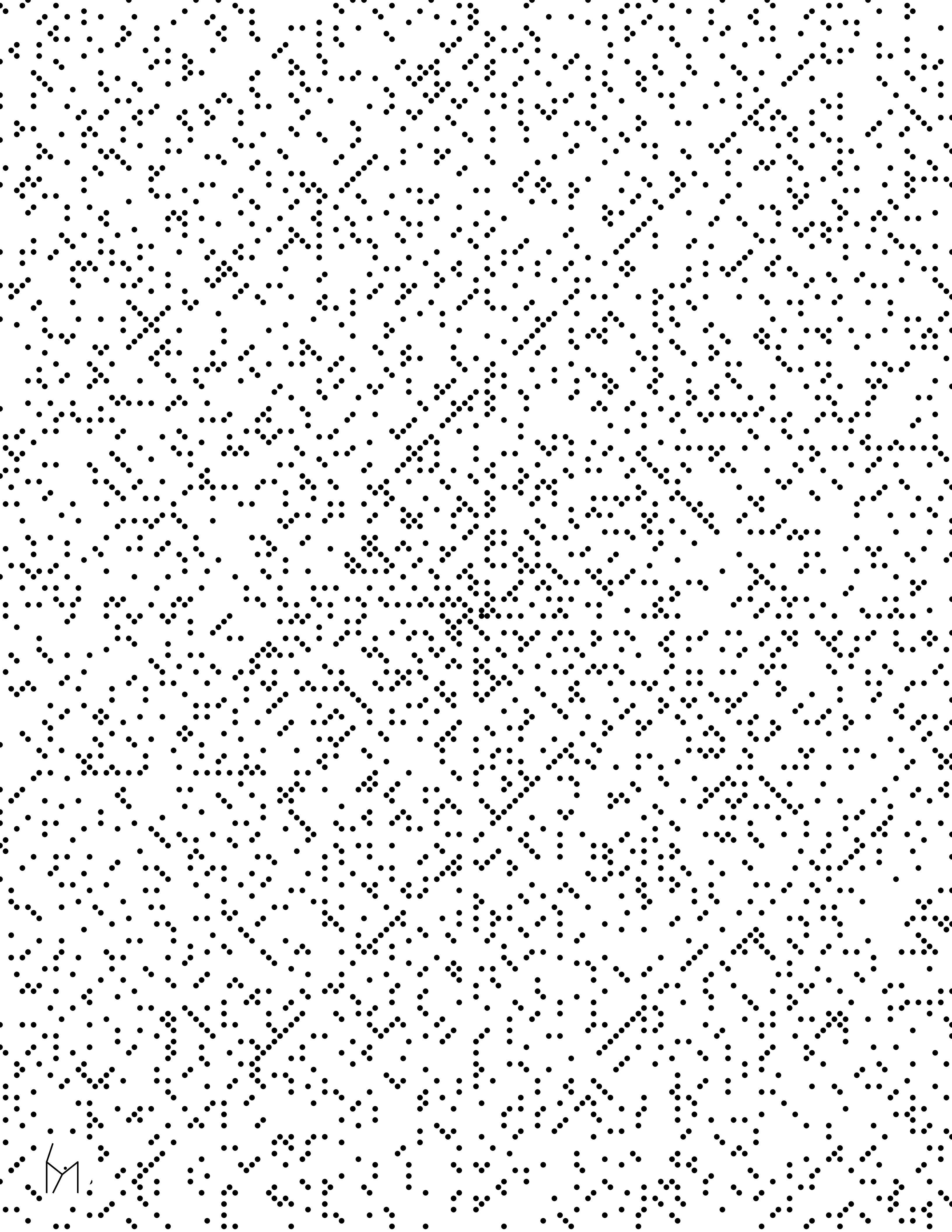
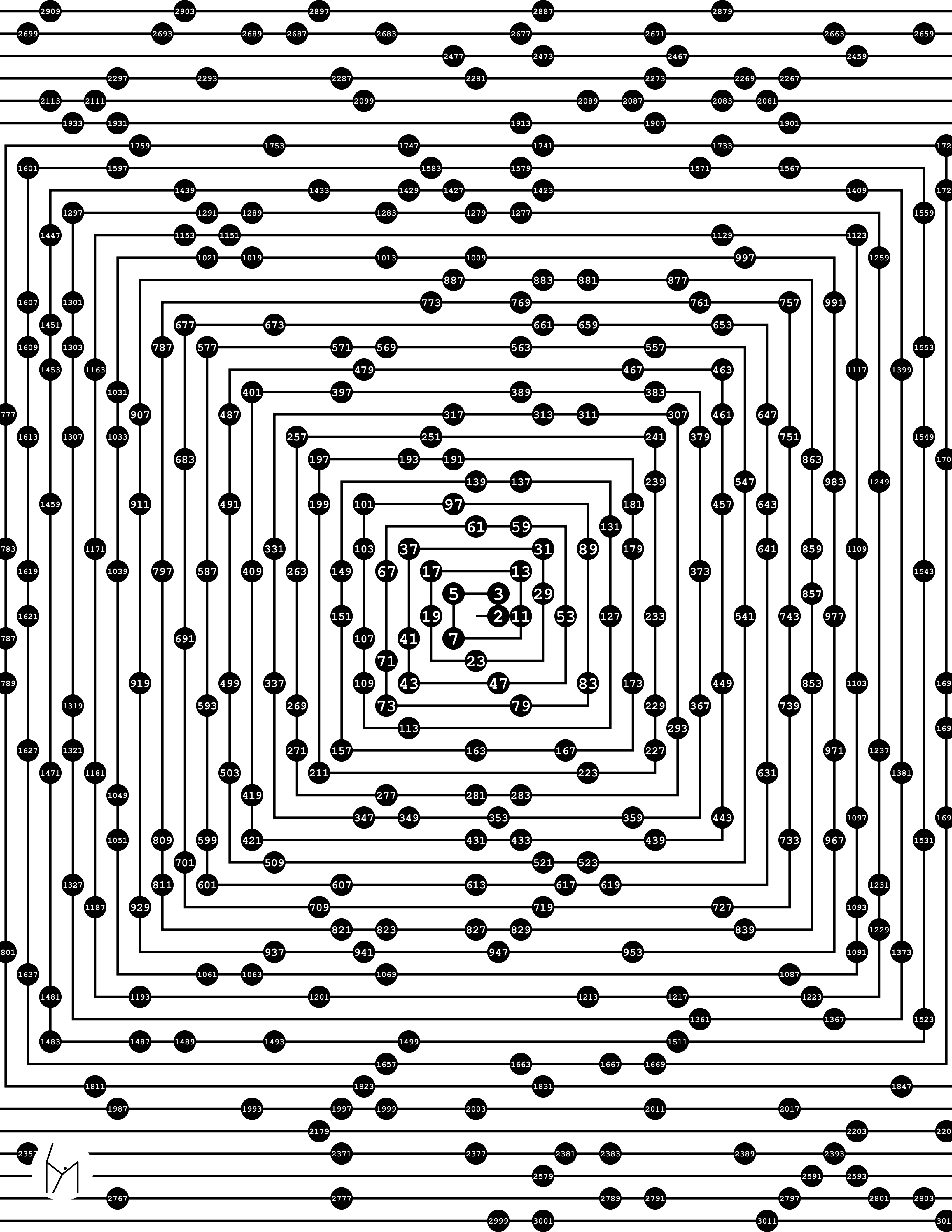
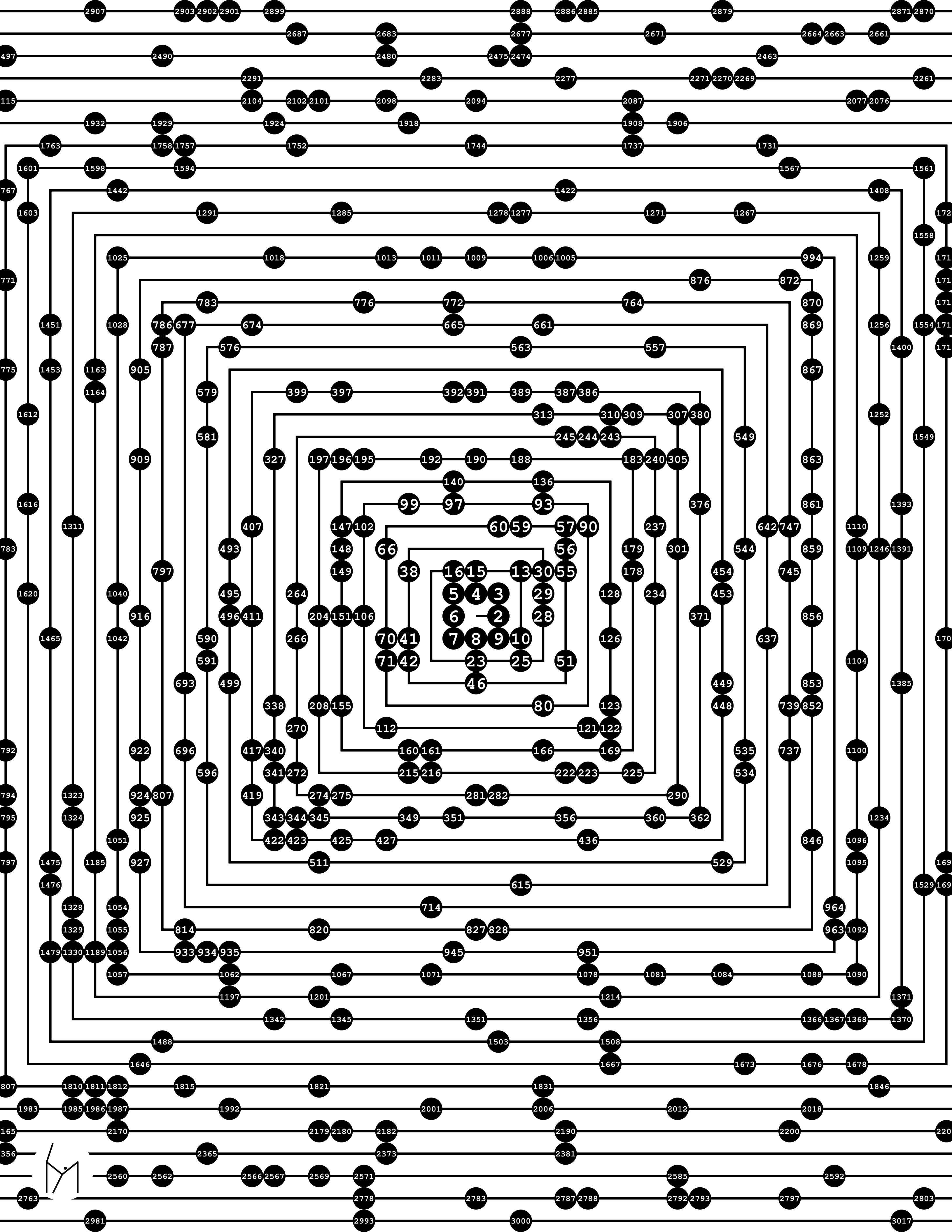
Is There a Pattern in the Primes?

Paul Pollack
Dartmouth College

July 28, 2006







Mathematicians have tried in vain to this day to discover some order in the sequence of prime numbers, and we have reason to believe that it is a mystery into which the human mind will never penetrate.

L. Euler

A Pattern in the Primes?

1	**2**
3	4
5	6
7	8
9	10
11	12
13	14
15	16
17	18
19	20
21	22
22	23
23	24
25	26
27	28
29	30

1	**2**	**3**	4	**5**	6
7	8	9	10	**11**	12
13	14	15	16	**17**	18
19	20	21	22	**23**	24
25	26	27	28	**29**	30
31	32	33	34	35	36
37	38	39	40	**41**	42
43	44	45	46	**47**	48
49	50	51	52	**53**	54
55	56	57	58	**59**	60
61	62	63	64	65	66
67	68	69	70	**71**	72
73	74	75	76	77	78
79	80	81	82	**83**	84
85	86	87	88	**89**	90
91	92	93	94	95	96
97	98	99	100	**101**	102

The Sollog Saga

> **Sollog** (born July 14, 1960 as John Patrick Ennis) is an American numerologist, mystic, and self-proclaimed psychic. He is also a self-published author and a self-described artist, musician, poet, and filmmaker.

– Wikipedia

Hey MORON,

The chart is a visual aid to show WHERE ALL PRIMES AND TWINS MUST FALL, which means they follow a [expletive deleted] PREDICTABLE PATTERN

Since you're a MORON, you can't comprehend what I posted [...]

When you can say here's 30 columns of numbers, these 8 hold all the primes and twin, that's a PATTERN [expletive deleted], that means what is taught is WRONG about Primes, no known pattern or distribution [...]

(from sci.math)

Are There Formulas for Primes?

Fermat's Guess:

$$2^{2^0} + 1 = 3$$

$$2^{2^1} + 1 = 5$$

$$2^{2^2} + 1 = 17$$

$$2^{2^3} + 1 = 257$$

$$2^{2^4} + 1 = 65537$$

Fermat's Conjecture: Each number $2^{2^n} + 1$ is prime.

Euler:

$$2^{2^5} + 1 = 641 \times 6700417$$

Modern Folklore Conjecture: The only numbers of the form $2^{2^n} + 1$ that are prime are the five examples found by Fermat.

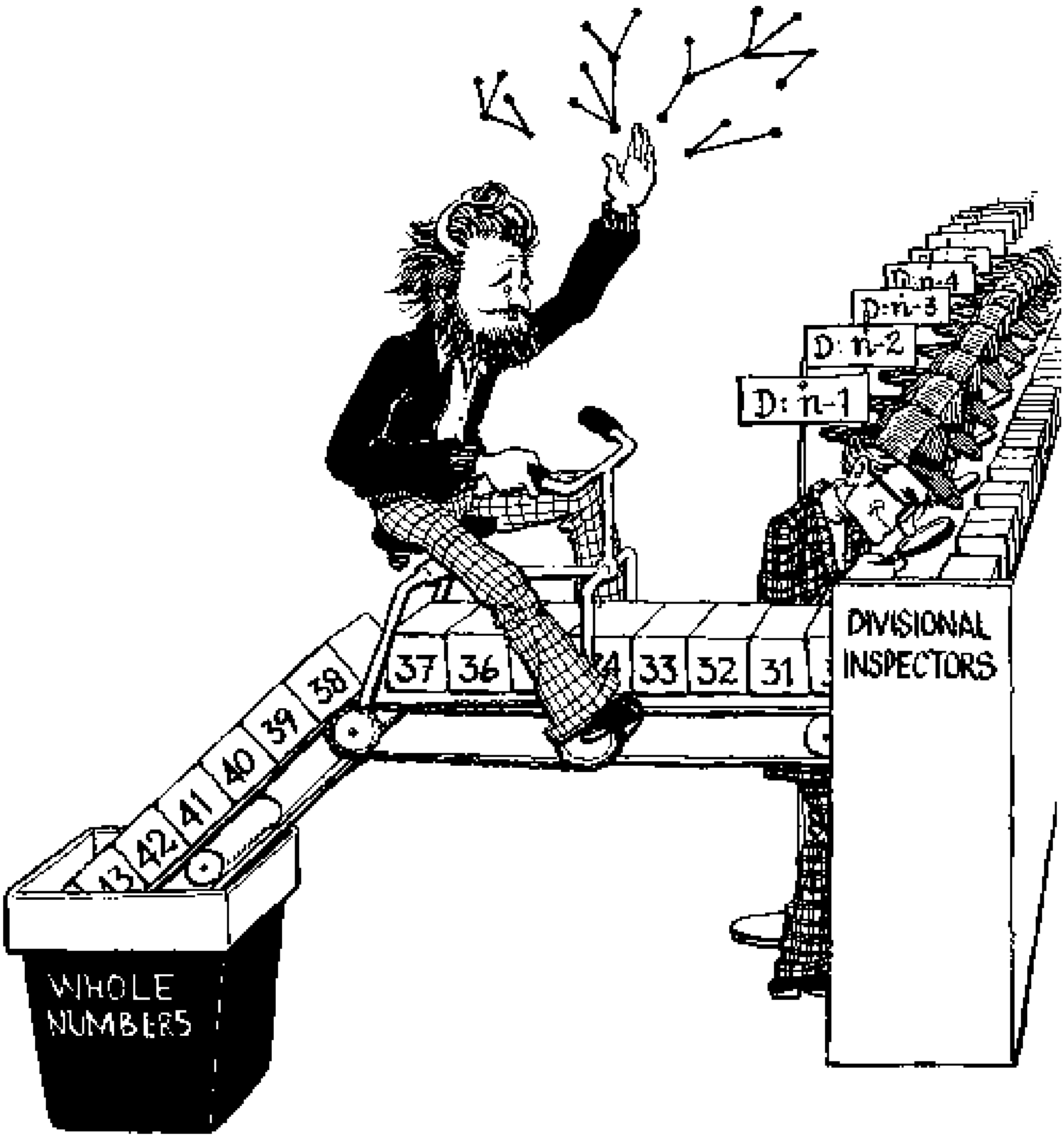
Another Prime Pattern

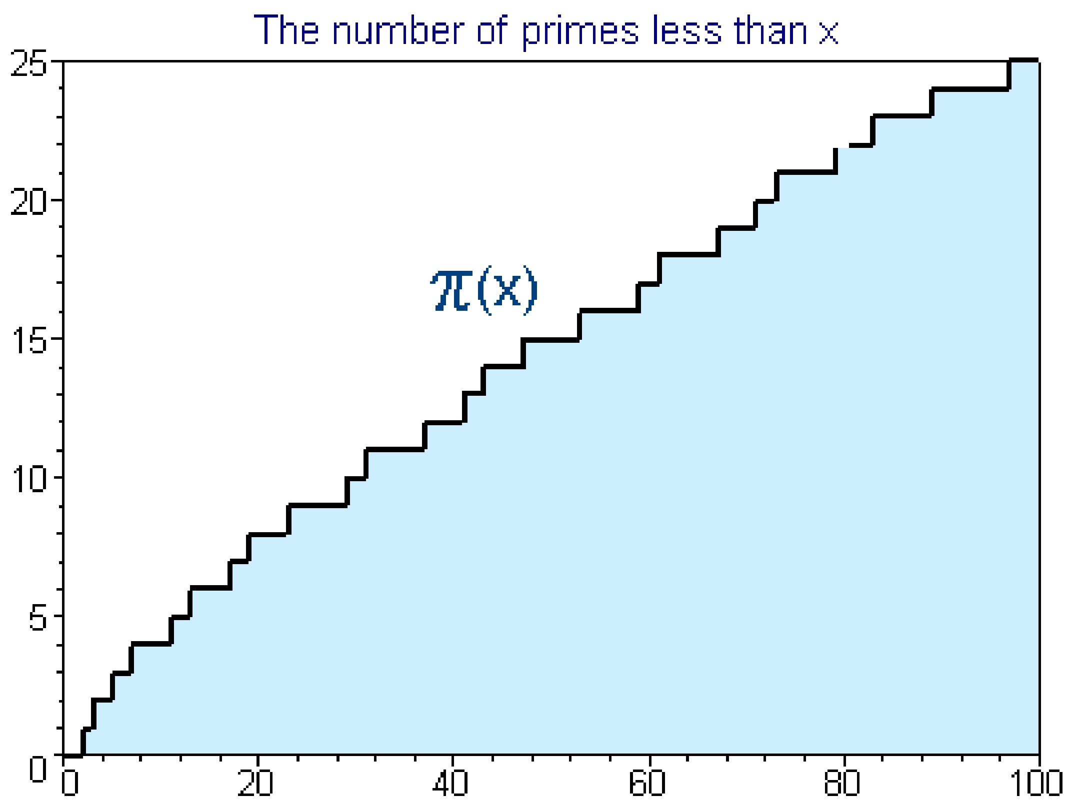
$41 + 2 =$

Conway's Prime Producing Machine

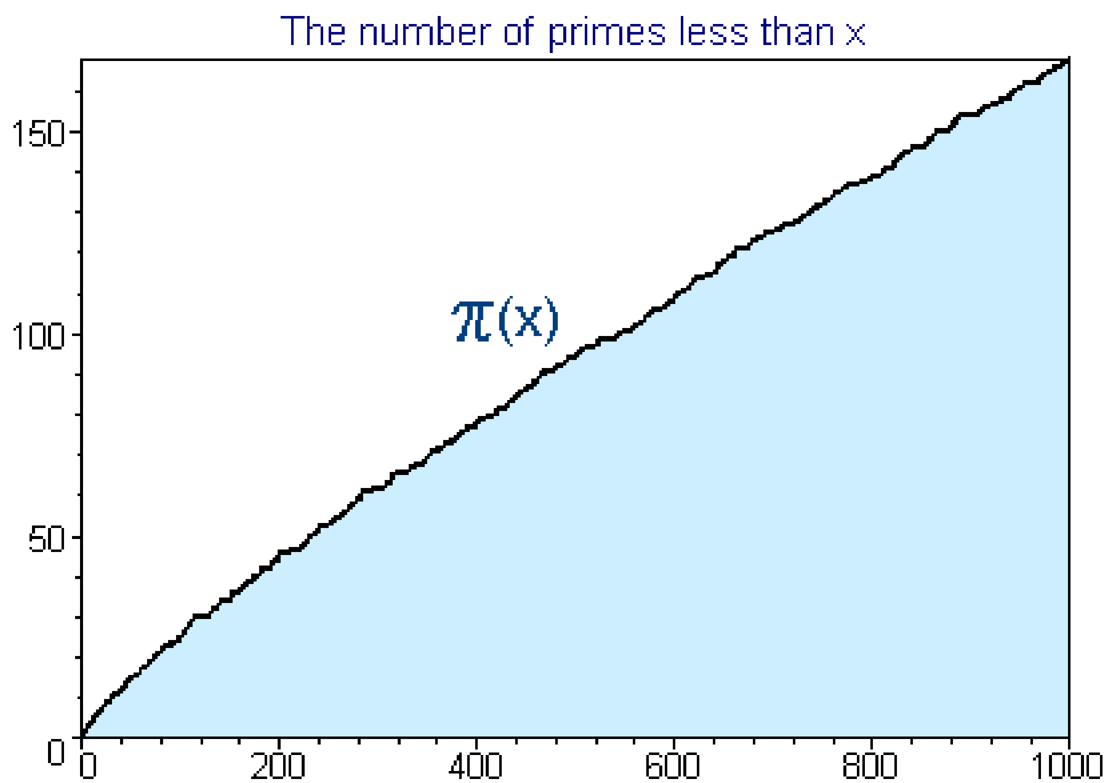
$$\frac{17}{91} \quad \frac{78}{85} \quad \frac{19}{51} \quad \frac{23}{38} \quad \frac{29}{33} \quad \frac{77}{29} \quad \frac{95}{23}$$

$$\frac{77}{19} \quad \frac{1}{17} \quad \frac{11}{13} \quad \frac{13}{11} \quad \frac{15}{14} \quad \frac{15}{2} \quad \frac{55}{1}$$


D: n-4
D: n-3
D: n-2
D: n-1
DIVISIONAL INSPECTORS
37 36 33 32 31
38 39 40 41 42 43
WHOLE NUMBERS



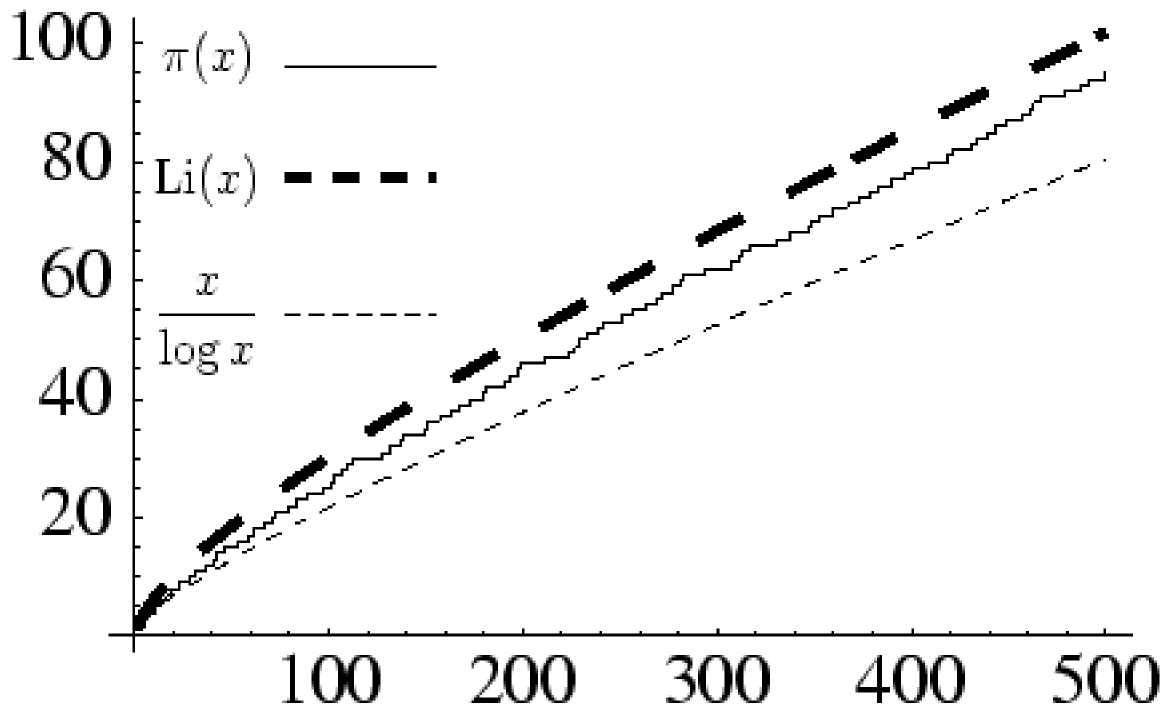
The number of primes less than x
π(x)
25
20
15
10
5
0
0
20
40
60
80
100



The number of primes less than x
150
100
50
0
0
200
400
600
800
1000
$\pi(x)$

Prime Number Theorem. *As N gets large, the relative error made by approximating $\pi(N)$ by $N/\ln(N)$ tends to zero percent.*

N	$\pi(N)$	$N/\ln N$	Error
10^3	168	145	13.7%
10^4	1,229	1086	11.6%
10^5	9,592	8686	9.4%
10^6	78,498	72,382	7.8%
10^7	664,579	620,420	6.6%
10^8	5,761,455	5,428,681	5.8%
10^9	50,847,534	48,254,942	5.1%
10^{10}	455,052,512	434,294,482	4.6%
10^{11}	4,118,054,813	3,948,131,654	4.1%
10^{12}	37,607,912,018	36,191,206,825	3.8%


100
80
60
40
20
$\pi(x)$
$\mathrm{Li}(x)$
$\frac{x}{\log x}$
100
200
300
400
500

The Sieve of Eratosthenes

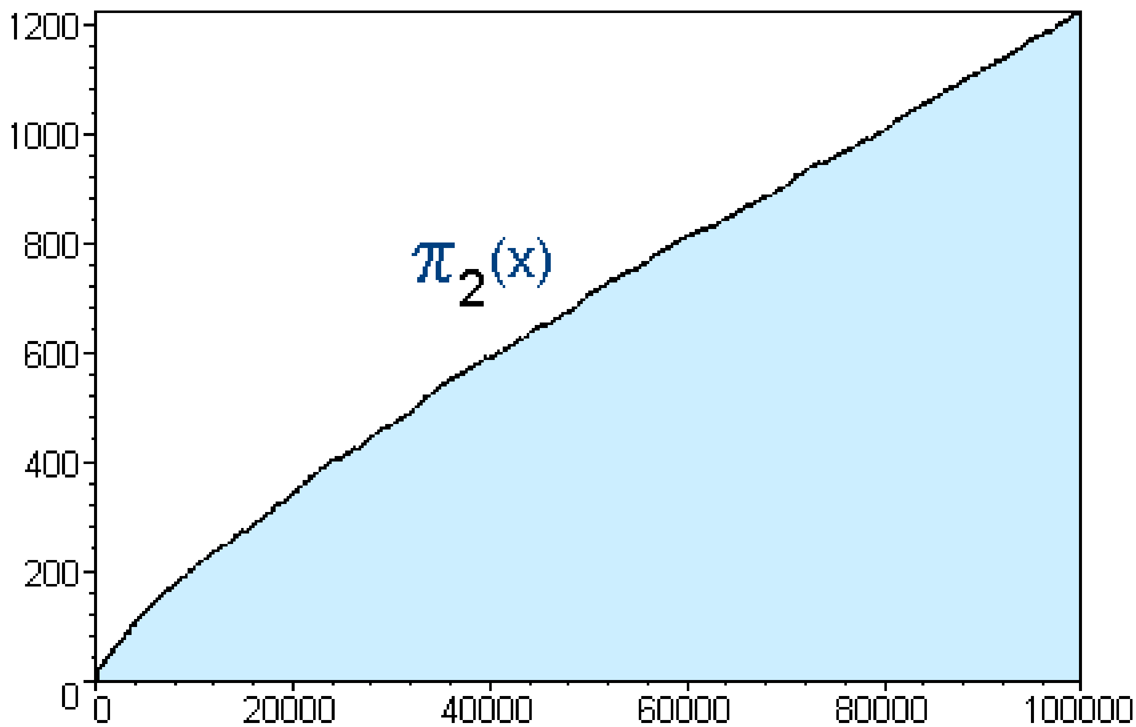
	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36				

The Hawkins Random Sieve

	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36				

Twin Primes

The number of twin primes less than x



It is evident that the primes are randomly distributed but, unfortunately, we don't know what 'random' means.

R. C. Vaughan