

The logarithm of z is a complex number w , such that $e^w = z$ and $\text{Ln}(z) = w$. In my theory, I represent z as the complex number $z = \left(\frac{n-1}{n+1}\right) + i\left(\frac{\sqrt{4n}}{n+1}\right)$, which is the same as Euler's $e^{it} = \cos(t) + i\sin(t)$, where $t = \arccos(x)$, and $x = \left(\frac{n-1}{n+1}\right) = 1 - \left(\frac{2}{n+1}\right)$, and $n = (1, 2, 3 \dots \infty)$. Taking it a step further with $d = (1, 2, 3, \dots n)$, you get a complex number $z_{nd} = x + iy$ and its conjugate such that,

$$x = 1 - \left(d \left(\frac{2}{n+1}\right)\right) = n+1 \text{ divisions (d) of the unit circle}$$

$$iy = \left(\frac{\sqrt{4d(n+1-d)}}{n+1}\right) = \text{secant lines of the } n+1 \text{ unit circle divisions (d)}$$

Equation 1.1 Unit circle: $z_{nd} = 1 - \left(d \left(\frac{2}{n+1}\right)\right) + i\left(\frac{\sqrt{4d(n+1-d)}}{n+1}\right)$

This basically encodes $n + 1$ as nodes of a standing wave which is a harmonic or overtone of 1 i.e. fundamental frequency. Now, project z_{nd} out from the unit circle concentrically, to go from a radius of 1 to a radius of $(n + 1)/2$.

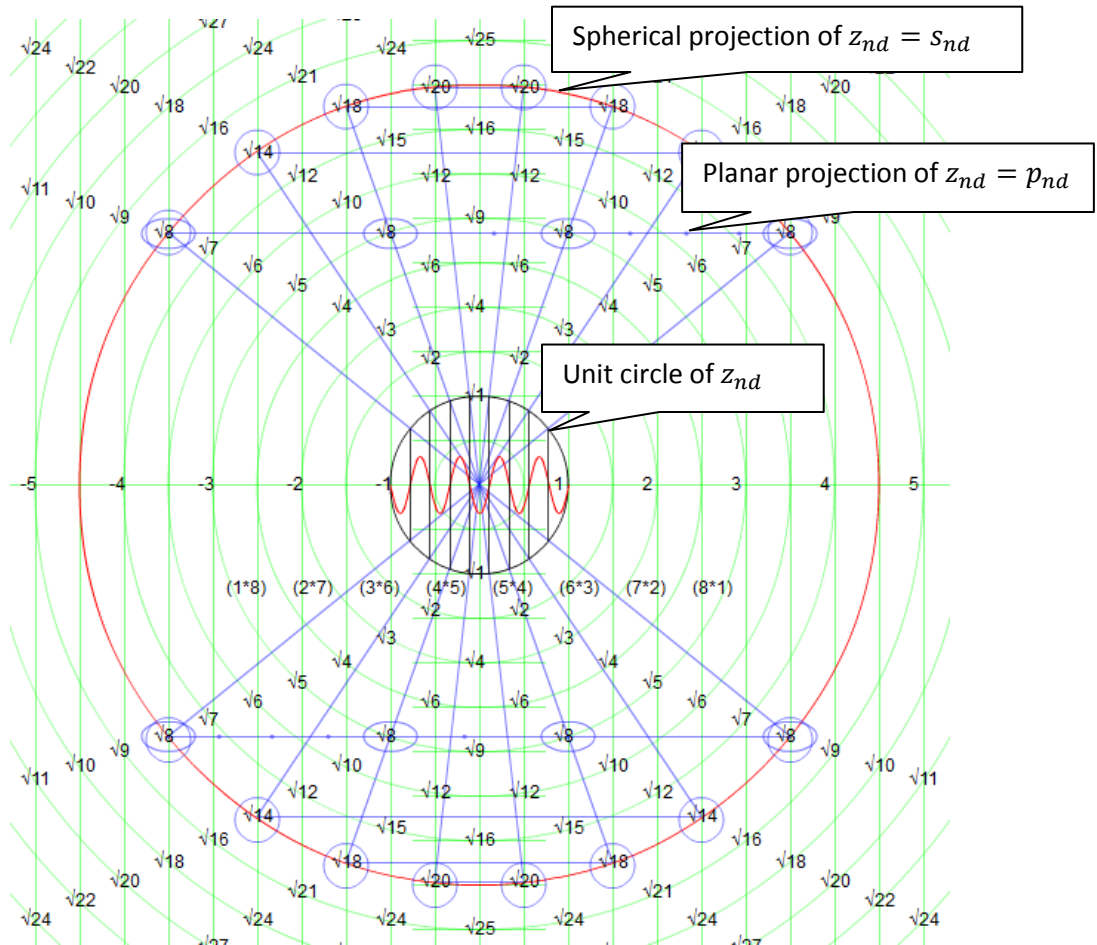


Figure 1.1 where $n = 8$. Notice the parabolic shape of the square root of integer multiples of d .

This spherical projection s of z_{nd} transforms $x + iy$ as follows:

$$x = \left(\frac{n+1}{2}\right) - d$$

$$iy = \sqrt{d(n+1-d)}$$

Equation 1.2 spherical projections: $s_{nd} = \left(\frac{n+1}{2}\right) - d + i\sqrt{d(n+1-d)}$

This transformation helps define a kind of propagating *wavefront*. The s_d points fall on spherical *wavefront* and the iy values fall on planar *wavefront*. These plane *wavefronts* carry some interesting properties, particularly when $iy = \sqrt{n}$. The collection of points or *locus*, propagates at a \sqrt{n} ratio to n , containing points at:

$$x = (n - d^2)/2d$$

$$iy = \sqrt{n}$$

Equation 1.3 planar projections: $p_{nd} = (n - d^2)/2d + i\sqrt{n}$

So as n goes to infinity, p_{nd} carries a set of points that define the parabolas created by the square root of integer multiples of d as mentioned in **Figure 1.1** These parabolas are of the standard form " $y^2 = 4px$ " such that " $p = \left(\frac{d}{2}\right)$ and $x = x + \left(\frac{d}{2}\right)$." Following the geometric "conic section" definition of a parabola, we get a visual representation of the traditional cone's side (triangle) and top (circle) view.

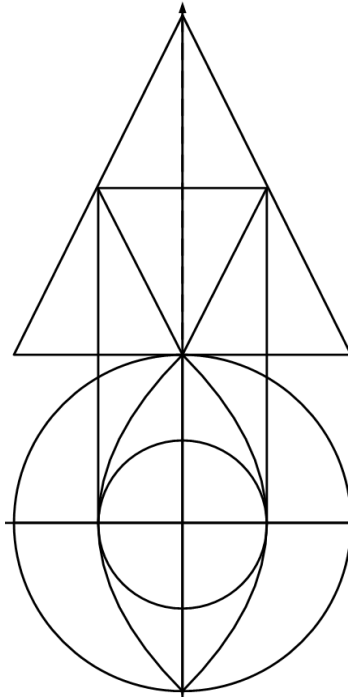


Figure 1.2 Conic section parabolas. $y^2 = 4\left(\frac{d}{2}\right)\left(x + \left(\frac{d}{2}\right)\right)$

So to reiterate the equations thus far we have with $n = (1,2,3 \dots \infty)$ and $d = (1,2,3, \dots n)$:

- Equation 1.1 Unit circle encoding of n : $z_{nd} = 1 - \left(d \left(\frac{2}{n+1}\right)\right) + i \left(\frac{\sqrt{4d(n+1-d)}}{n+1}\right)$
- Equation 1.2 Spherical projections of z_{nd} : $s_{nd} = \left(\frac{n+1}{2}\right) - d + i\sqrt{d(n+1-d)}$
- Equation 1.3 Planar projections of z_{nd} : $p_{nd} = (n - d^2)/2d + i\sqrt{n}$
- Figure 1.2 Conic section parabolas. $iy^2 = 4\left(\frac{d}{2}\right)\left(x + \left(\frac{d}{2}\right)\right)$

Let's focus on the $s_{nd} = x + iy$ equation right now. When s_{nd} is a Gaussian integer it is also a Pythagorean triple. These s_{nd} Gaussian integers follow the equation:

$$x = \left(\frac{dn^2 + d}{2}\right) - d$$

$$iy = \sqrt{d(dn^2)}$$

* when d is an odd integer then n must be also

Equation 1.4 Gaussian Integers: $g_{nd} = \left(\frac{dn^2+d}{2}\right) - d + i\sqrt{d(dn^2)}$

The Pythagorean triples $a^2 + b^2 = c^2$, are derived from g_{nd} by $a = iy$ and $b = x$, such that $c = b = d$. It's fairly obvious to see that when $d = 1$ and n is odd, then g_{nd} is a primitive Pythagorean triple. If $d = 1$ and n is even, then $2 * g_{nd}$ is a Pythagorean triple. It's no wonder then, that a scatter plot of Pythagorean triples faintly outline the same parabolic shape shown in **Figure 1.2**.

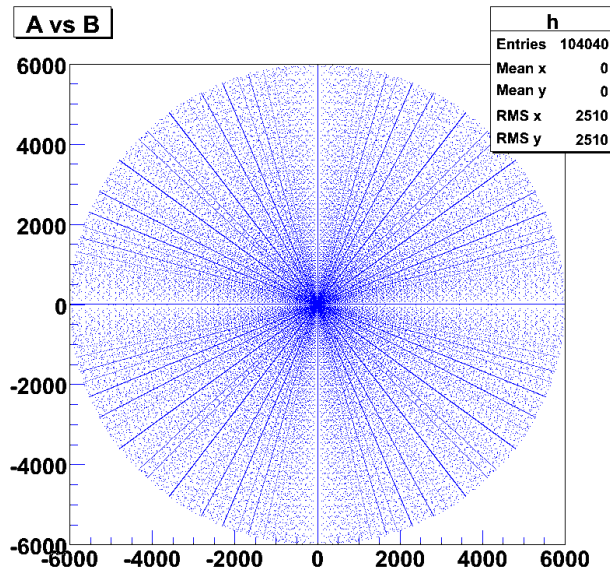


Figure 1.3 A scatter plot of the legs (a,b) of the Pythagorean triples with c less than 6000. Negative values are included to illustrate the parabolic patterns in the plot more clearly.

Microsoft Excel - New prime.xlsx																											
	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB			
1	1	1	0	1		3	2	0	2		5	3	0	3		7	4	0	4		9	5	0	5			
2	4	2	1.5	2.5		9	4	3	5		14	6	4.5	7.5		19	8	6	10		24	10	7.5	12.5			
3	9	3	4	5		19	6	8	10		29	9	12	15		39	12	16	20		49	15	20	25			
4	16	4	7.5	8.5		33	8	15	17		50	12	22.5	25.5		67	16	30	34		84	20	37.5	42.5			
5	25	5	12	13		51	10	24	26		77	15	36	39		103	20	48	52		129	25	60	65			
6	36	6	17.5	18.5		73	12	35	37		110	18	52.5	55.5		147	24	70	74		184	30	87.5	92.5			
7	49	7	24	25		99	14	48	50		149	21	72	75		199	28	96	100		249	35	120	125			
8	64	8	31.5	32.5		129	16	63	65		194	24	94.5	97.5		259	32	126	130		324	40	157.5	162.5			
9	81	9	40	41		163	18	80	82		245	27	120	123		327	36	160	164		409	45	200	205			
10	100	10	49.5	50.5		201	20	99	101		302	30	148.5	151.5		403	40	198	202		504	50	247.5	252.5			
11	121	11	60	61		243	22	120	122		365	33	180	183		487	44	240	244		609	55	300	305			
12	144	12	71.5	72.5		289	24	143	145		434	36	214.5	217.5		579	48	286	290		724	60	357.5	362.5			
13	169	13	84	85		339	26	168	170		509	39	252	255		679	52	336	340		849	65	420	425			
14	196	14	97.5	98.5		393	28	195	197		590	42	292.5	295.5		787	56	390	394		984	70	487.5	492.5			
15	225	15	112	113		451	30	224	226		677	45	336	339		903	60	448	452		1129	75	560	565			
16	256	16	127.5	128.5		513	32	255	257		770	48	382.5	385.5		1027	64	510	514		1284	80	637.5	642.5			
17	289	17	144	145		579	34	288	290		869	51	432	435		1159	68	576	580		1449	85	720	725			
18	324	18	161.5	162.5		649	36	323	325		974	54	484.5	487.5		1299	72	646	650		1624	90	800.5	812.5			
19	361	19	180	181		723	38	360	362		1085	57	540	543		1447	76	720	724		1809	95	907	905			
20	400	20	199.5	200.5		801	40	399	401		1202	60	598.5	601.5		1603	80	798	802		2004	100	997.5	1002.5			
21	441	21	220	221		883	42	440	442		1325	63	660	663		1767	84	880	884		2209	105	1100	1105			
22	484	22	241.5	242.5		969	44	483	485		1454	66	724.5	727.5		1939	88	966	970		2424	110	1207.5	1212.5			
23	529	23	264	265		1059	46	528	530		1589	69	792	795		2119	92	1056	1060		2649	115	1320	1325			
24	576	24	287.5	288.5		1153	48	575	577		1730	72	862.5	865.5		2307	96	1150	1154		2884	120	1437.5	1442.5			
25	625	25	312	313		1251	50	624	626		1877	75	936	939		2503	100	1248	1252		3129	125	1560	1565			
26	676	26	337.5	338.5		1353	52	675	677		2030	78	1012.5	1015.5		2707	104	1350	1354		3384	130	1687.5	1692.5			
27	729	27	364	365		1459	54	728	730		2189	81	1092	1095		2919	108	1456	1460		3649	135	1820	1825			
28	784	28	391.5	392.5		1569	56	783	785		2354	84	1174.5	1177.5		3139	112	1566	1570		3924	140	1957.5	1962.5			
29	841	29	420	421		1683	58	840	842		2525	87	1260	1263		3367	116	1680	1684		4209	145	2100	2105			
30	900	30	449.5	450.5		1801	60	899	901		2702	90	1348.5	1351.5		3603	120	1798	1802		4504	150	2247.5	2252.5			
31	961	31	480	481		1923	62	960	962		2885	93	1440	1443		3847	124	1920	1924		4809	155	2400	2405			
32	1024	32	511.5	512.5		2049	64	1023	1025		3074	96	1534.5	1537.5		4099	128	2046	2050		5124	160	2557.5	2562.5			
33	1089	33	544	545		2179	66	1088	1090		3269	99	1632	1635		4359	132	2176	2180		5449	165	2720	2725			
34	1156	34	577.5	578.5		2313	68	1155	1157		3470	102	1732.5	1735.5		4627	136	2310	2314		5784	170	2887.5	2892.5			
35	1225	35	612	613		2451	70	1224	1226		3677	105	1836	1839		4903	140	2448	2452		6129	175	3060	3065			
36	1296	36	647.5	648.5		2593	72	1295	1297		3890	108	1942.5	1945.5		5187	144	2590	2594		6484	180	3237.5	3242.5			
37	1369	37	684	685		2739	74	1368	1370		4109	111	2052	2055		5479	148	2736	2740		6849	185	3420	3425			
38	1444	38	721.5	722.5		2889	76	1443	1445		4334	114	2164.5	2167.5		5779	152	2886	2890		7224	190	3607.5	3612.5			
39	1521	39	760	761		3043	78	1520	1522		4565	117	2280	2283		6087	156	3040	3044		7609	195	3800	3805			
40	1600	40	799.5	800.5		3201	80	1599	1601		4802	120	2398.5	2401.5		6403	160	3198	3202		8004	200	3997.5	4002.5			
41	1681	41	840	841		3363	82	1680	1682		5045	123	2520	2523		6727	164	3360	3364		8409	205	4200	4205			
42	1764	42	881.5	882.5		3529	84	1763	1765		5294	126	2644.5	2647.5		7059	168	3526	3530		8824	210	4407.5	4412.5			
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Figure 1.4 Gaussian Integers: $g_{nd} = \left(\frac{dn^2+d}{2}\right) - d + i\sqrt{d(dn^2)}$
** when d is an odd integer then n must be also*

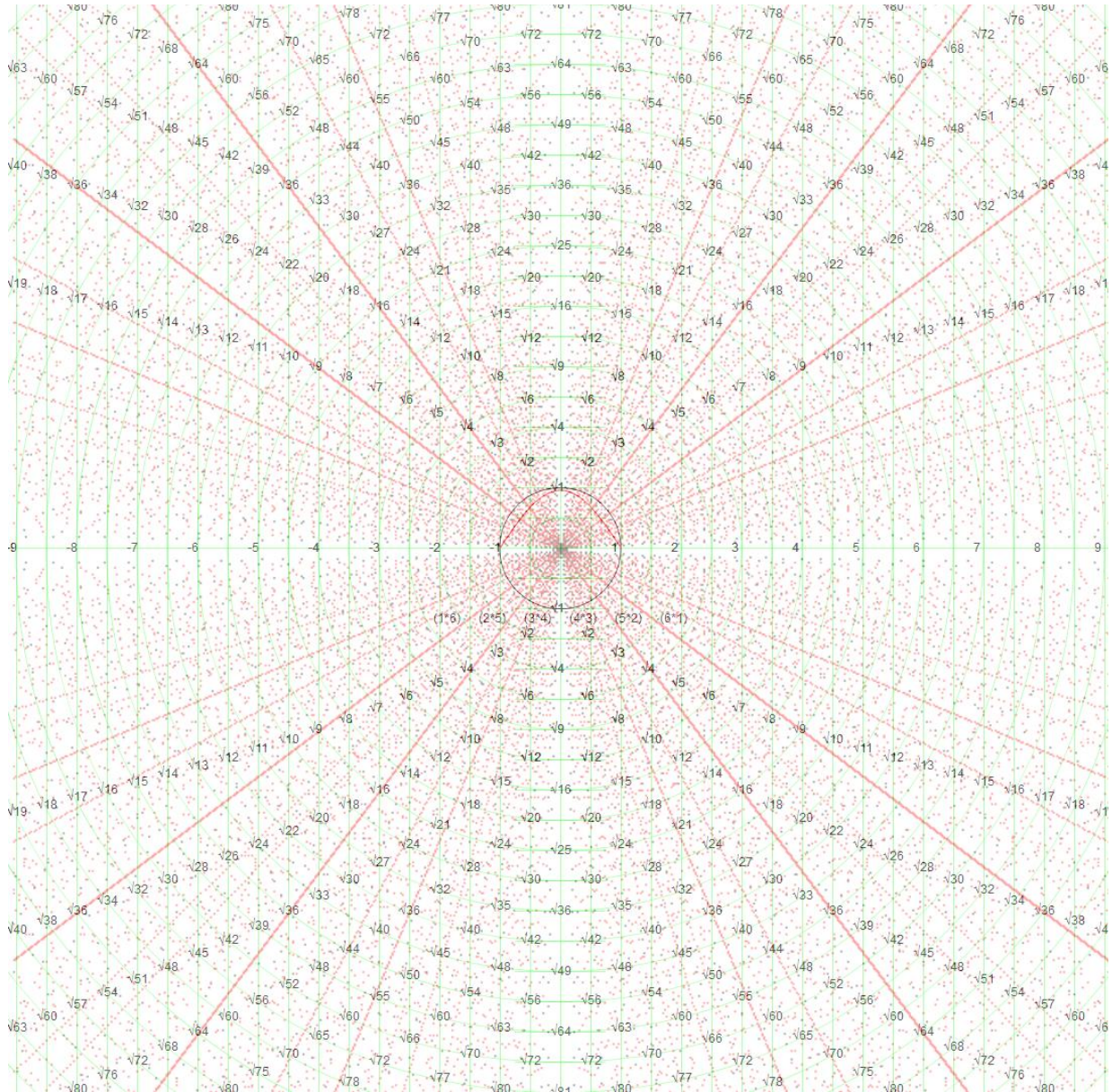


Figure 1.4 The Pythagorean triples scatter plot overlay of **Equation 1.2** spherical projections $p_{nd} = \left(\frac{n+1}{2}\right) - d + i\sqrt{d(n+1-d)}$. Notice the dark lines of the scatter plot highlight square number vectors.

Now let's take another look at **Equation 1.3** planar projections $p_{nd} = \frac{(n-d^2)}{2d} + i\sqrt{n}$. As n goes to infinity, p_{nd} carries a *locus* that defines the parabolas created by the square root of multiples of d . When $\frac{(n-d^2)}{2d} = 0 \pmod{.5}$ then d is a factor of n so if n is prime then when $d = 1$ or n .

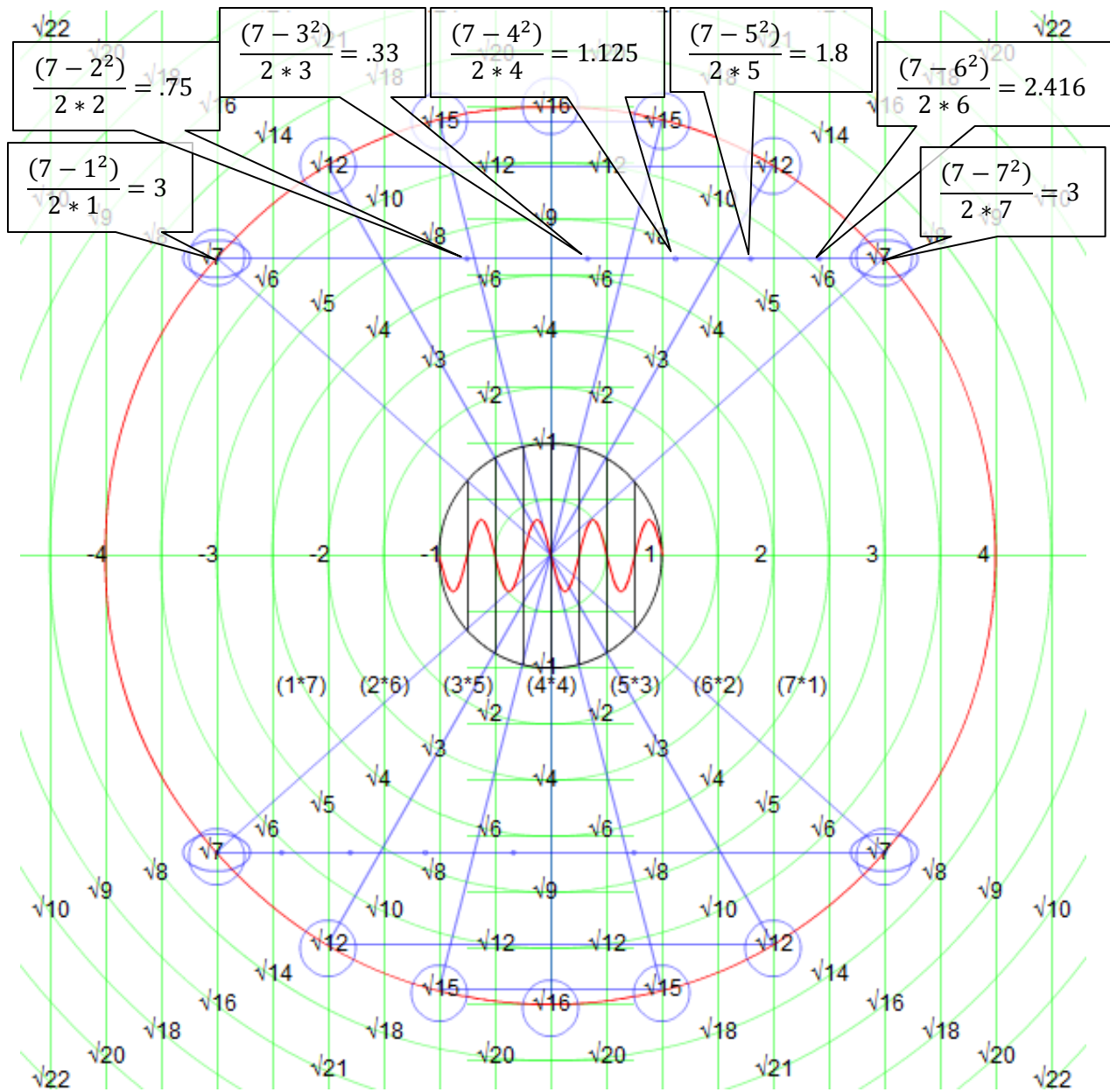


Figure 1.5 planar projections $p_{nd} = \frac{(n-d^2)}{2d} + i\sqrt{n}$ where $n=7$. Notice the collection of points defining the parabolas of d only intersect the lattice points at 1 and n when n is prime.

I would like to offer up a new type of lattice that seems to be the basis for these equations. I refer to this lattice as the Pythagorean lattice. The lattice points are created by a very simple moiré pattern derived from the intersections of evenly spaced concentric circles and lines.

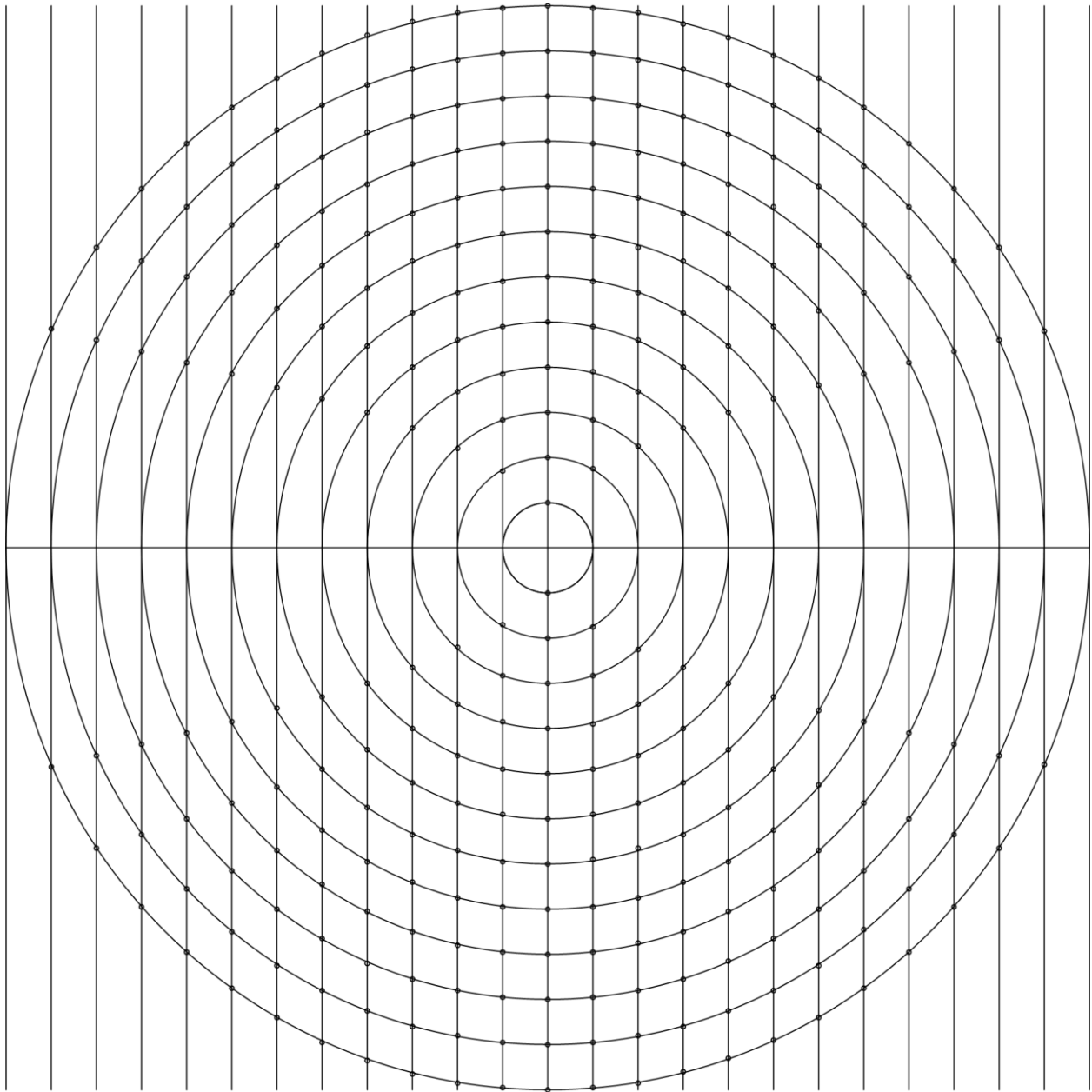


Figure 1.6 the Pythagorean Lattice

In the Pythagorean lattice the square root of primes numbers only intersect lattice points on the parabola with a vertex of $\frac{1}{2}$ effectively defining all prime numbers. What is the connection to the non-trivial zeros of the Riemann zeta function?

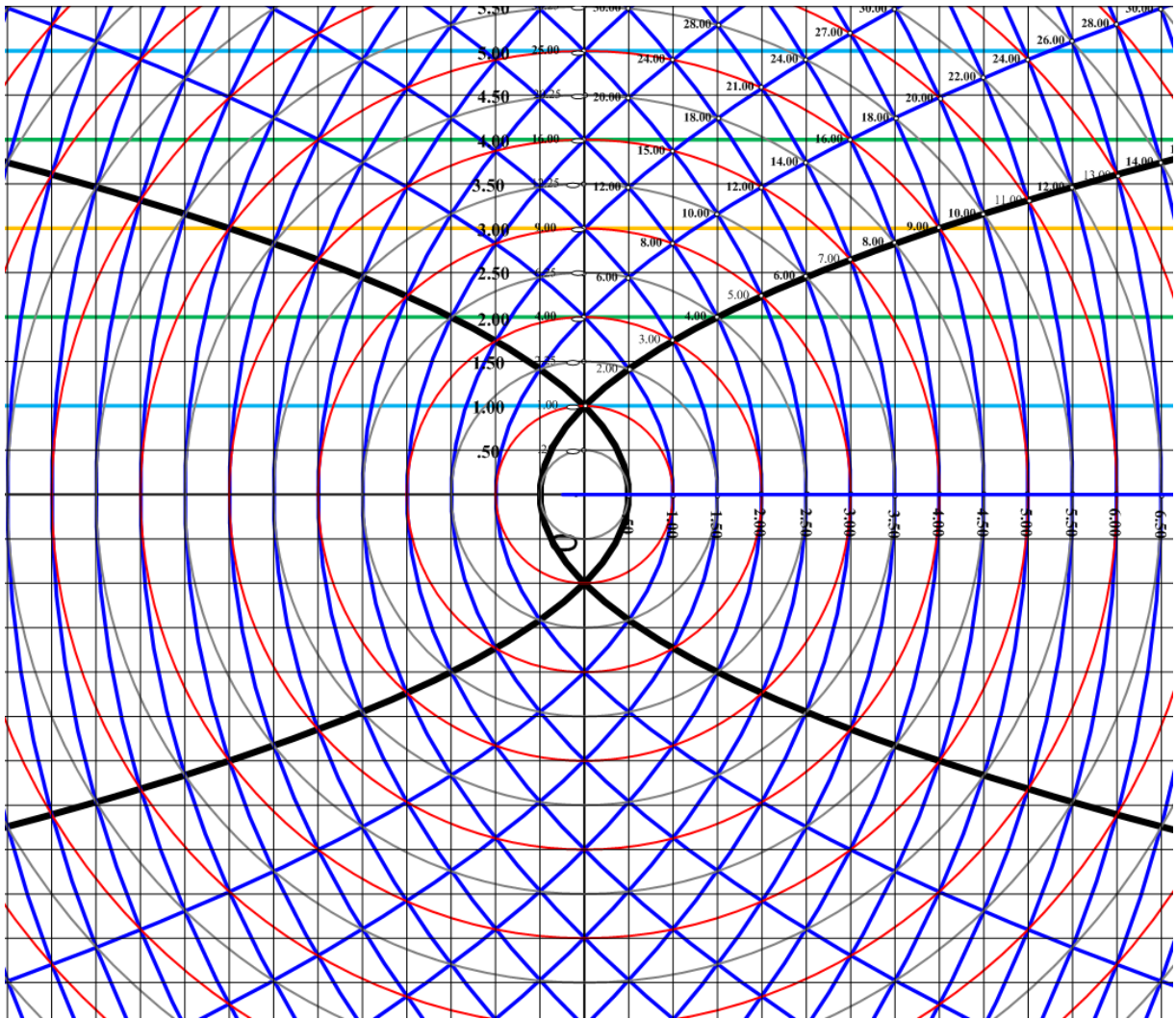


Figure 1.7 In the Pythagorean lattice the square root of primes numbers only intersect lattice points on the parabola with a vertex of $\frac{1}{2}$ effectively defining all prime numbers.