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ภาคผนวก

สูตร

(FORMULAE)

อนุกรม

(SERIES)

$$\sin x = x - \frac{x^3}{\lfloor 3} + \frac{x^5}{\lfloor 5} - \frac{x_7}{\lfloor 7} + \ldots\ldots\ldots\ldots$$

$$\cos x = I - \frac{x^2}{\lfloor 2} + \frac{x^4}{\lfloor 4} - \frac{x^6}{\lfloor 6} + \ldots\ldots\ldots$$

$$\tan x = x + \frac{x^3}{3} + \frac{2x^5}{15} + \frac{17x^7}{315} + \ldots\ldots\ldots$$

$$\sin^{-1}x = x + \frac{x^3}{6} + \frac{3x^5}{40} + \frac{5x^7}{112} + \ldots\ldots\ldots$$

$$\tan^{-1}x = x - \frac{x^3}{3} + \frac{x^5}{5} - \frac{x^7}{7}$$

ทฤษฎีบวนเทอมคู่หรือบททวินาม

(BINOMIAL THEOREM)

$$(a + b)^m = a^m + ma^{m-1}b + \frac{m(m-1)}{\lfloor 2} a^{m-2}b^2 + \ldots\ldots\ldots$$

ทฤษฎีแมคลอแรง

(MACLAURIN'S THEOREM)

$$f(x) = f(0) + \frac{x}{1} f'(0) + \frac{x^2}{\lfloor 2} f''(0) + \frac{x^3}{\lfloor 3} f'''(0) + \cdots\cdots$$

ทฤษฎีของเทเลอร์

(TAYLOR'S THEOREM)

$$f(x + h) = f(x) + hf'(x) + \frac{h^2}{\lfloor 2} f''(x) + \frac{h^3}{\lfloor 3} f'''(x) + \cdots\cdots$$

อนุกรมพสะคณิต

(LOGARITHMIC SERIES)

$$\log(1 + x) = M(x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \cdots\cdots)$$

$$\log(1 - x) = M(x + \frac{x^2}{2} + \frac{x^3}{3} + \frac{x^4}{4} + \cdots\cdots)$$

อนุกรมอื่น ๆ

(OTHER SERIES)

$$\frac{1}{1 - x} = 1 + x + x^2 + x^3 + \cdots\cdots$$

$$\frac{1}{1 + x} = 1 - x + x^2 - x^3 + \cdots\cdots$$

วงรี และทรงรี

(ELLIPSE AND SPHEROID)

$$c^2 = \frac{a^2 - b^2}{a^2}$$

$$f = \frac{a - b}{a}$$

$$R_m = \frac{a(1 - e^2)}{(1 - e^2\sin^2\varnothing)^{\frac{3}{2}}}$$

$$N = \frac{a}{(1 - e^2\sin^2\varnothing)^{\frac{1}{2}}}$$

$$R_\alpha = \frac{NR_m}{N\cos^2\alpha + R_m\sin^2\alpha}$$

$$\text{Mean radius} = = \sqrt{NR_m}$$

ตัวคงที่

(CONSTANTS)

$$\log_{10} x = M \log_e x$$

$$M = \text{modulus of system of common logarithms}$$

$$= 0.43\ 2945$$

$\log M = 9.637\ 7843$

$\pi = 3.141\ 592\ 65 \quad \log = 0.497\ 1499$

$\frac{180}{\pi} = 57.29577 \quad \log = 1.758\ 1226$

$\frac{180° \times 60'}{\pi} = 3437.747 \quad \log = 3.537\ 2739$

$\frac{180° \times 60' \times 60''}{\pi} = 206\ 264.8 \quad \log = 5.314\ 4251$

$= \frac{1}{\text{arc } 1''} = \frac{1}{\sin 1''} = \frac{1}{\tan 1''}$ (Approx)

$\text{arc } 1'' = 0.000\ 004\ 848\ 137 \quad \log = 4.685\ 5749$

$\frac{1}{\text{arc } 1''} = 206\ 264.806 =$ number of seconds in the radian.

arc 1″ = about 0.3 inch at distance of one mile.

ทรงรีคลาร์ค

(CLARKE SPHEROID (1866))

a = 6 378 206.4 meters. log = 6.804 6986

b = 6 356 583.8 meters. log 6.803 2238 =

e^2 .006 768 658 log 7.830 5026 – 10

$1 - e^2$ 9.997 0504 – 10

$a(1 - e^2)$ 6.801 7490

$\frac{e^2 \sin^2 1''}{6(1 - e^2)}$ 6.426 4506 – 20

$\frac{e^2 \sin 1''}{4(1 - e^2)}$	1.916 9670 – 10
$\frac{\sin^2 1''}{12}$	8.291 9685 – 20
sin 1"	4.685 5740 – 10

ทรงรีกรมสำรวจชายฝั่ง

(COAST SURVEY SPHEROID (1909))

a = 6 378 ± 18 meters.

$\frac{1}{f}$ 297.0 ± 0.5

b = 6 356 909 meters.

ความสัมพันธ์ระหว่างหน่วยความยาว

(RELATION BETWEEN UNITS OF LENGTH)

1 ฟุต	= 0.304 8006 เมตร	log = 9.484 0158
1 เมตร	= 3.280 8333 ฟุต	log = 0.515 9842
1 เมตร	= 39.97 นิ้ว	

ตารางที่ 1

ตารางหาความแข็งแรงของรูปในโครงข่ายสามเหลี่ยม

°	10°	12°	14°	16°	18°	20°	22°	24°	26°	28°	30°	35°	40°	45°	50°	55°	60°	65°	70°	75°	80°	85°	90°
10	428	359																					
12	359	295	253																				
14	315	253	214	187																			
16	284	225	187	162	143																		
18	262	204	168	143	126	113																	
20	245	189	153	130	113	100	91																
22	232	117	142	119	103	91	81	74															
24	221	167	134	111	95	83	74	67	61														
26	213	160	126	104	89	77	68	61	56	51													
28	206	153	120	99	83	72	63	57	51	47	43												
30	199	148	115	94	79	68	59	53	48	43	40	33											
35	188	137	106	85	71	60	52	46	41	37	33	27	23										
40	179	129	99	79	65	54	47	41	36	32	29	23	19	16									
45	172	124	93	74	60	50	43	37	32	28	25	20	16	13	11								
50	167	119	89	70	57	47	39	34	29	26	23	18	14	11	9	8							
55	162	115	86	67	54	44	37	32	27	24	21	16	12	10	8	7	5						
60	159	112	83	64	51	42	35	30	25	22	19	14	11	9	7	5	4	4					
65	155	109	80	62	49	40	33	28	24	21	18	13	10	7	6	5	4	3	2				
70	152	106	78	60	48	38	32	27	23	19	17	12	9	7	5	4	3	2	2	1			
75	150	104	76	58	46	37	30	25	21	18	16	11	8	6	4	3	2	2	1	1	1		
80	147	102	74	57	45	36	29	24	20	17	15	10	7	5	4	3	2	1	1	1	0	0	
85	145	100	74	55	43	34	28	23	19	16	14	10	7	5	3	2	2	1	1	0	0	0	0
90	143	98	71	54	42	33	27	22	19	16	13	9	6	4	3	2	1	1	1	0	0	0	0
95	140	96	70	53	42	32	26	22	18	15	13	9	6	4	3	2	1	1	0	0	0	0	
100	138	95	68	51	40	31	25	21	17	14	12	8	6	4	3	2	1	1	0	0	0		
105	136	93	67	50	39	30	25	20	17	14	12	8	5	4	2	2	1	1	0	0			
110	134	91	65	49	38	30	24	19	16	13	11	7	5	3	2	2	1	1	1				
115	132	89	64	48	37	29	23	19	15	13	11	7	5	3	2	2	1	1					
120	129	88	62	46	36	28	22	18	15	12	10	7	5	3	2	2	1						
125	127	86	61	45	35	27	22	18	14	12	10	7	5	4	3	2							
130	125	84	59	44	34	26	21	17	14	12	10	7	5	4	3								
135	122	82	58	43	33	26	21	17	14	12	10	7	5	4									
140	119	80	56	42	32	25	20	17	14	12	10	8	6										
145	116	77	55	41	32	25	21	17	15	13	11	9											
150	112	75	54	40	32	26	21	18	16	15	13												
152	111	75	53	40	32	26	22	19	17	16													
154	110	74	53	41	33	27	23	21	19														
156	108	74	54	42	34	28	25	22															
158	107	74	54	43	35	30	27																
160	107	74	56	45	38	33																	
162	107	76	59	48	42																		
164	109	79	53	54																			
166	113	86	71																				
168	122	98																					
170	143																						

ตารางที่ 2

ค่าอินติกรวล (เต็มหน่วย) ผลคาดคะเน $\frac{2}{\sqrt{\pi}} \int_0^{\tau} e^{-t^2} dt.$

สำหรับ Argument t or hx.

hx.	0	1	2	3	4	5	6	7	8	9	Diff.
0.0	0.0000	0.0113	0.0226	0.0338	0.0451	0.0564	0.0676	0.0789	0.0901	0.1013	113
0.1	1125	1236	1348	1459	1569	1680	1790	1900	2009	2118	110
0.2	2227	2335	2443	2550	2657	2763	2869	2974	3079	3183	106
0.3	3286	3389	3491	3593	3694	3794	3893	3992	4090	4187	100
0.4	4284	4380	4475	4569	4662	4755	4847	4937	5027	5117	92
0.5	0.5205	0.5292	0.5379	0.5465	0.5549	0.5633	0.5716	0.5798	0.5879	0.5959	83
0.6	6039	6117	6194	6270	6346	6420	6494	6566	6638	6708	74
0.7	6778	6847	6914	6981	7047	7112	7175	7238	7300	7361	64
0.8	7421	7480	7538	7595	7651	7707	7761	7814	7867	7918	55
0.9	7969	8019	8068	8116	8163	8209	8254	8299	8342	8385	45
1.0	0.8427	0.8468	0.8508	0.8548	0.8586	0.8624	0.8661	0.8698	0.8733	0.8768	37
1.1	8802	8835	8868	8900	8931	8961	8991	9020	9048	9076	30
1.2	9103	9130	9155	9181	9205	9229	9252	9275	9297	9319	23
1.3	9340	9361	9381	9400	9419	9438	9456	9473	9490	9507	18
1.4	9523	9539	9554	9569	9583	9597	9611	9624	9637	9649	14
1.5	0.9661	0.9673	0.9684	0.9695	0.9706	0.9716	0.9726	0.9736	0.9745	0.9755	10
1.6	9763	9772	9780	9788	9796	9804	9811	9818	9825	9832	7
1.7	9838	9844	9850	9856	9861	9867	9872	9877	9882	9886	5
1.8	9891	9895	9899	9903	9907	9911	9915	9918	9922	9925	4
1.9	9928	9931	9934	9937	9939	9942	9944	9947	9949	9951	3
2.0	0.9953	0.9955	0.9957	0.9959	0.9961	0.9963	0.9964	0.9966	0.9967	0.9969	2
2.1	9970	9972	9973	9974	9975	9976	9977	9979	9980	9980	1
2.2	9981	9982	9983	9984	9985	9985	9986	9987	9987	9988	1
2.3	9989	9989	9990	9990	9991	9991	9992	9992	9992	9993	
2.4	9993	9993	9994	9994	9994	9995	9995	9995	9995	9996	
2.	0.9953	0.9970	0.9981	0.9989	0.9993	0.9996	0.9998	0.9999	0.9999	0.9999	
∞	1.0000										
hx.	0	1	2	3	4	5	6	7	8	9	Diff.

ตารางที่ 3

ค่าอินติกรวล (เต็มหน่วย) ผลคาดคะเน $\frac{2}{\sqrt{\pi}} \int_0^{\tau} e^{-t^2} dt.$

สำหรับ Argument $\frac{t}{0.4769}$ or $\frac{x}{r}$

$\frac{x}{r}$	0	1	2	3	4	5	6	7	8	9	Diff.
0.0	0.0000	0.0054	0.0108	0.0161	0.0215	0.0269	0.0323	0.0377	0.0430	0.0484	54
0.1	0538	0591	0645	0699	0752	0806	0859	0913	0966	1020	54
0.2	1073	1126	1180	1233	1286	1339	1392	1445	1498	1551	53
0.3	1603	1656	1709	1761	1814	1866	1918	1971	2023	2075	52
0.4	2127	2179	2230	2282	2334	2385	2436	2488	2539	2590	51
0.5	0.2641	0.2691	0.2742	0.2793	0.2843	0.2893	0.2944	0.2994	0.3043	0.3093	50
0.6	3143	3192	3242	3291	3340	3389	3438	3487	3535	3583	49
0.7	3632	3680	3728	3775	3823	3870	3918	3965	4012	4059	46
0.8	4105	4152	4198	4244	4290	4336	4381	4427	4472	4517	45
0.9	4562	4606	4651	4695	4739	4783	4827	4860	4914	4957	43
1.0	0.5000	0.5043	0.5085	0.5128	0.5170	0.5212	0.5254	0.5295	0.5337	0.5378	41
1.1	5419	5460	5500	5540	5581	5620	5660	5700	5739	5778	39
1.2	5817	5856	5894	5932	5970	6008	6046	6083	6120	6157	37
1.3	6194	6231	6267	6303	6339	6375	6410	6445	6480	6515	35
1.4	6550	6584	6618	6652	6686	6719	6753	6786	6818	6851	32
1.5	0.6883	0.6915	0.6947	0.6979	0.7011	0.7042	0.7073	0.7104	0.7134	0.7165	30
1.6	7195	7225	7255	7284	7313	7342	7371	7400	7428	7457	28
1.7	7485	7512	7540	7567	7594	7621	7648	7675	7701	7727	26
1.8	7753	7778	7804	7829	7854	7879	7904	7928	7952	7976	24
1.9	8000	8023	8047	8070	8093	8116	8138	8161	8183	8205	22
2.0	0.8227	0.8248	0.8270	0.8291	0.8312	0.8332	0.8353	0.8373	0.8394	0.8414	19
2.1	8433	8453	8473	8492	8511	8530	8549	8567	8585	8604	18
2.2	8622	8639	8657	8674	8692	8709	8726	8742	8759	8775	17
2.3	8792	8808	8824	8840	8855	8870	8886	8901	8916	8930	15
2.4	8945	8960	8974	8988	9002	9016	9029	9043	9056	9069	13
2.5	0.9082	0.9095	0.9108	0.9121	0.9133	0.9146	0.9158	0.9170	0.9182	0.9193	12
2.6	9205	9217	9228	9239	9250	9261	9272	9283	9293	9304	10
2.7	9314	9324	9334	9344	9354	9364	9373	9383	9392	9401	9
2.8	9410	9419	9428	9437	9446	9454	9463	9471	9479	9487	8
2.9	9495	9503	9511	9519	9526	9534	9541	9548	9556	9563	7
3.0	0.9570	0.9577	0.9583	0.9590	0.9597	0.9603	0.9610	0.9616	0.9622	0.9629	6
3.1	9635	9641	9647	9652	9658	9664	9669	9675	9680	9686	5
3.2	9691	9696	9701	9706	9711	9716	9721	9726	9731	9735	5
3.3	9740	9744	9749	9753	9757	9761	9766	9770	9774	9778	4
3.4	9782	9786	9789	9793	9797	9800	9804	9807	9811	9814	4
3.	0.9570	0.9635	0.9691	0.9740	0.9782	0.9818	0.9848	0.9874	0.9896	0.9915	
4.	9930	9943	9954	9963	9970	9976	9981	9985	9988	9990	
5.	9993	9994	9996	9997	9997	9998	9998	9999	9999	9999	
∞	1.0000										
$\frac{x}{r}$	0	1	2	3	4	5	6	7	8	9	Diff.


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