I

Bought this book
in Köln.

1876 March 6

March 6 – Eclipse.
Readings of Light Variable
3 Intense colors
21 Green 43 Red 64 Violet
Zero

45·4
46·0
45·3
46·1
46·1
45·5
45·0
45·1
45·0
45·1
45·46

21 – 43 | 21 – 64 | 43 – 64
47·0 | 69·7 | 66·3
47·3 | 68·7 | 67·1
47·0 | 71·6 | 63·1
47·1 | 70·0 | 66·2
47·15 | 69·57 | 65·7
.03 | .127 | .345
.38 | .383

Experiments for Spectrum
— Intake Sunrise
Earth Light.

46°	10′	−	8	64	
	24	+	6	36	
	19	+	1	1	
	35	+	17	289	
	6	−	12	144	
	29	+	11	121	
	18		0	0	
	22	−	4	16	
	23	+	5	25	
45	56	−	22	484	
46	20	+	2	4	
	33	+	15	225	
	19	+	1	1	
	34	+	16	256	
	1	−	7	49	
45	56	−	22	484	
46	3	−	15	225	
	36	+	18	324	
	10	−	9	64	
	16	−	2	4	
	17	−	1	1	
	26	+	8	64	
	5	−	13	169	
	24	+	6	36	
	18		0	0	
	450			2030	7
46°	18′			12	8

Illinois Central No. 11

Prob error of single obs
$= 9\frac{1}{2}' = \frac{.0054}{1.0000}$

19	361							
6	36							
19	361							
13	169							
7	81							
1	1							
4	16							
12	144							
3	9							
1	1							
15	225							
3	9							
2	4							
12	144							
22	484							
1	1							
25	625							
7	49							
15	225							
4	16							
16)238	3616							
5)14	87							
	37							
	6							
	±4							

Berlin Observ
Comparison
orbits compared

Zero -

~~45 29~~
~~30~~

44°	2′	134	13 - 135	19	- 45°	40′		
	27		8	37		16		
	40	133	576	36		48		
	8	134	13	22		56		
	20	133	2304	56		45		
44	27	134	07½ - 135	34	- 45	41		
	- 39	134	8					
37	63	133	578					
47	24	134	19					
	41		4					
	12		9					
		134	07					

1.1559
.7829
0.9649
1.32'

.6357
2.8296
.1641 ±3

18.7
5

Prob error of 10 obs. ± 13′ and an 37′ and 47′ differ by 3 times this amount. That is no discordance existing in the differences.

Dark red Lick-
for Berlin

115° 6′

Double red Iodide
mercuric

115	44	38	1444
116	28	82	6724
115	14	8	64
	33	77	729
	30	24	576
	29	23	529
113	58	68	4624
115	47	41	1681
	1	5	25
	1	5	25
	31	25	425
	16	0	0
	42	36	1296
	0	6	36
113	35	9	81
114	20	46	2116
115	7	1	1
	8	2	4
114	1	59	2601
113	42	84	7056
115	24	23	529
114	24	42	1764
115	35	29	841
	8	2	4
	38	32	1024
	625		42597
	14		

Mean 115° 6

4.6294 Comp. 47
1.3802 115° 53
3.2492 Ratio of Light 2.068
1.6246
9.6290
1.4536
Curl. em = 28.4
= 21/1008

5233
0.3144 Y
3050
.0072
47

Mar 8

Berlin — Thursday Good Night

I see the good morning

Mark's answer paper ↓

133	58	3	9
	55	2	4
	44	4	16
	33	6	36
	22	2	4
	11	1	1
134	6	11	121
133	42	13	169
	37	2	4
	9)554		9)374
	61.2		41

Mean 55 — 28 — 39

Median 52 — 40 — 36

Probability of H 3 = 25/1000

Sun's Day Afternoon.

Sight of Sun's Lower Limb.

+ 134° 4′ − 135° 21′ = 45′ 32′ + 44° 9′

Simultaneous Sight of Sun's Upper Limb.

+ 133	39	24	576
134	23	19	361
	15	13	169
		10	100
133	53		1225
134°	31′		306
			17·5

Single Prob error $12' = \frac{70}{100}$ mm

Shaded shade

+ 134	41	7	49
	32	3	9
	28	6	36
	32	2	4
	36	2	4
	30		92
134	34		91
			5

Prob error $1 \cdot 6 = 3\frac{1}{3}'$

Dorothea Shadbolt

1341 C
26

Smith
1341 9
1335 53
1341 10
21

56
1341 7

An inference having been made, it comes up for reconsideration. This will take two directions.

First, inquiring into the grounds of the premises

Second into the validity of the reasoning.

The Pelle consists in supplying the premises which were tacitly presupposed.

Both processes according to the rule may be carried back indefinitely without reaching the ultimate premises.

The proof that the first may be carried back indefinitely is this

Every premise is a proposition; no proposition is directly observed; whatever is not directly observed is the conclusion of an inference or at least it has to be justified by a proof with premises.

The real mental process in reaching a proposition can be infinite as in the inferences but that is it's equivalent when analyzed. Like an infinite series in algebra.

Remember first form

Flaquier. Lent on the ancient ad.
Like an infinite series in algebra.

In regard to the difference between a primary & a leading principle

A leading principle is a habit of mind. Not necessarily a belief. It can be one must be aware of a habit have some sensation to make it a belief.

What is the difference between what is primary? What is any difference except that one is primary & one is not?

The practical mental association supposes a thought & a belief. What is the difference?

~~A~~ must have first some sensible element. Then there must be a habit connecting this with another sensation.

Now they tell me I have omitted attention.

May 19

Strong light

May 19

Zero

~~155°~~

135°	2′	45°	13′
	4	44	40
134	44	45	12
	22	44	26
135	44	45	00
			37
135	00	44	54

Pretty good light

21 – 43

1	47°	22′
2	50	9
3	51	15
4	50	10
5	52	24
6	53	49
7	49	35
8	48	32
9	46	22
10	48	53
	96	359
	50°	2′

Strong light

21 – 43

1	43°	24′
2	44	31
3	44	21
4	42	00
5	42	29
6	41	8
7	42	51
8	40	7
9	42	21
10	45	4
	421	189
		30
		489
	42°	49′

This means red (43) is a little brighter than green (21)

Rather Dark (Difficult to discern)

21 – 43

1	40°	6′
2	45	1
3	42	28
4	39	35
5	44	2
6	44	17
7	44	30
8	45	29
9	46	1
10	42	7
	28	156
	430	4′

Bird projection apparatus

White Paper good light

76 59
50° 2'

28 [illegible]
43° 4'

Tirah mosch...ofan

1	52	29
	1	58
	5	29
	1	10
	3	58
	1	18
	1	15
24		193
		24
		433

52° 43'

White Paper good light
Kino-champ

45° 49'

3 1
3 7
6 5
6 6
4 6
6 5
4 4
4 9
4 6
5 5
4 1
4 5
5 3
4 8
5 9
6 6
2 1
3 2
4 5
4 4
1 3
2 5
7 6
2 3
3 8

21

May 27

Zero $45^{\circ}\ 54'$

30

33

44 57

46 9

---

43 - 21 43 Dunbar

$51^{\circ}\ 27'$

53 2

53 11

50 45

48 35

$51^{\circ}\ 02'4'$

1847 Feb 6

.0002527 log tan 45° + 1'
.0025266 log tan 45° + 10'
.0252805 log tan 45° + 100'

17' in one per cent

24) 2.01
0.50.25
8.4
2.1
1.05
3.5
.002

17) 7.0
41

Prob error = ±.0041

Prob error 2/10 of 1 per cent

Only 9 minutes

1497
5.98%

Middle Allotting papers

			Diff from Mean	log tan	
1	45°	12'	+ 2	+.000	5
	44	58	− 2.2	−	5 −
	45	56	+ 6	+	2
	44	58	− 2	−	2 −
5					4
	45	7	+ 9	+	7
		0			
	45	7	+ 7	+	5
		5			
	45	5	+ 5	+	3
		6			
10	44		2.2		8
		35	− 5	−	5
		52	+ 2	+	3
		56	+ 6	+	5
		56	+ 6	+	5
		57	+ 7	+	6
15		57	+ 7	+	6
		57	+ 7	+	6
		57	+ 7	+	6

Read "Fundamental Bearings" before C"

Noise makes me nervous

			Diff
44°	33'	+	1.2
	6	−	1.3
	18	−	0.5
	24	+	0.8
	2	+	0.0
	18	−	0.1
	3	−	2.1
	1	−	1.1
	8	+	1.1
	4	+	1.1
	9	+	1.1
	35	+	1.1
	32	+	1.1
	24	+	2.1
	27	−	1.1
	26	−	1.1
	27	+	1.1
	26	+	1.1
	23	+	1.1
	536		22.8

bad light

Mean 44° 24' 13" = 1.0 25.4

24)228
4) 9.5
2.4
3)11.9
3.0
17)7.9
+.0046 Prob error.

836
4
21,44

4/6

Mon. 140° 53' 6" 2.28
= 1.0 25

Reed's "chrome yellow Sheet A
Cal. to 2"

		Diff
1	44° 30'	
2	26	4
3	44	18
4	34	10
5	44	10
	54	10
	44	10
	33	11
	55	22
	44	11
	32	12
	44	12
	44	0

44° 39' 6"
± 8.1

Drift Plotting paper

	46	1'	Diff	p
1	44° 62		+ 16	
2	57		+ 5	
3	53		+ 2	
4	42		+ 4	
5	56		+ 10	
	51		+ 5	
	41		+ 5	
	52		+ 6	
10	52		+ 2	
	42		+ 2	
	60		+ 14	
	36		+ 10	
	50		+ 4	
	60		+ 22	
15	42		+ 2	
	53		+ 7	
	43		+ 2	
	38		+ 8	
	46		+ 0	
	23		+ 23	
20	33		+ 13	
	23		+ 23	
	49		+ 3	
	41		+ 4	
	46		+ 0	
25	32		+ 14	
26				
	1041		216	
	44 48.3		8.64	

± 1.4

4) 8.64
2.16
1) 10.80
3.60
7.20

± 0042 Prof

Pumpkin grey glazed paper

± 0.42 Vinh Yên

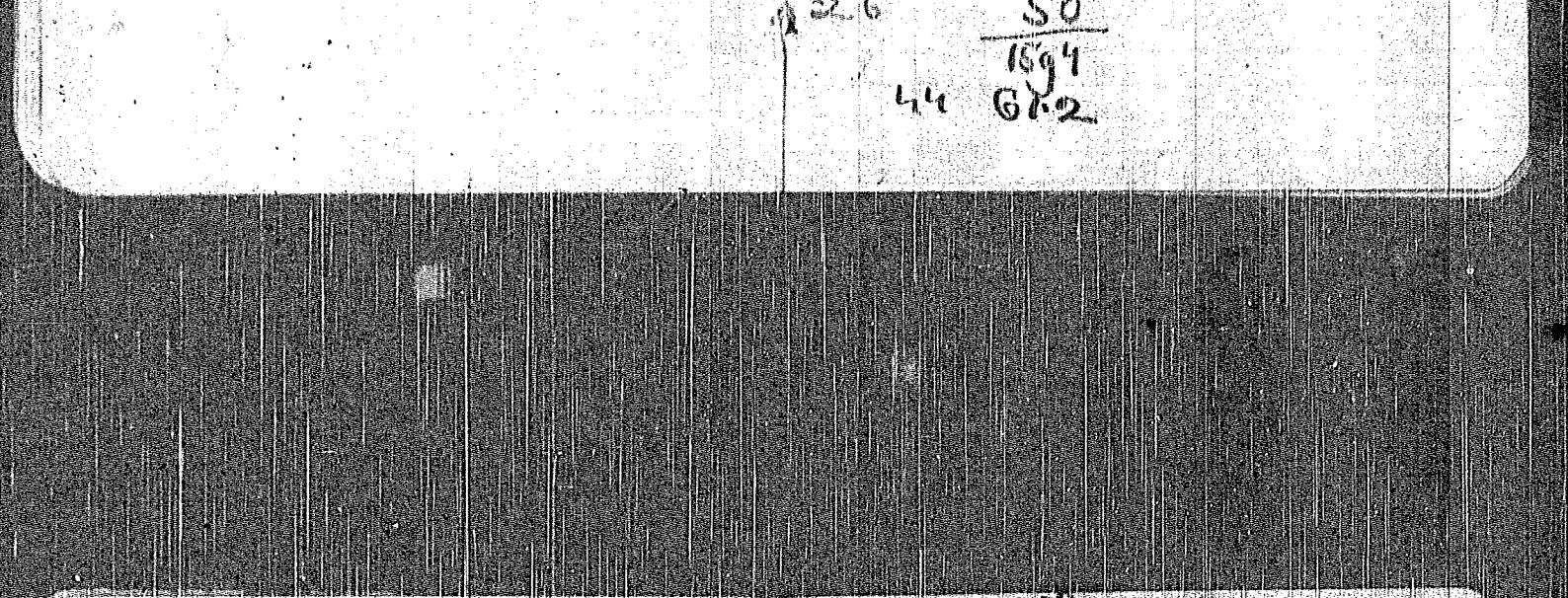
± 1.14

Purplish gray glazed paper

1	44° 57	1	−	06
2		77	+	63
3		56	−	50
4		56	−	38
5		58	+	50
		56	+	26
		45	+	88
10		44	−	51
		26	−	
		95	+	
		95	+	
		88	+	
15		25	+	
		25	−	
		25	−	
		25	−	
20		25	−	
		25	−	
		25	−	
		25	−	
25		25	−	
26		50	−	
	44	62.2		

Lemon yellow glazed paper

1	44° 31'			
3		91		



Feb 7

55
50
57
30

24 | 192 | 8

80
676

Prob error ±.0040

14.9
40.2
63.1
31.6

49.5
1.029

Rod "Fundamental Set year before"

1	44°	27'	-7	45°	78 +14
2		47	+13		52 +12
		26	-8		66 +2
		35	+1		59 -5
		47	+13		61 -3
		21	-13		72 +6
		34	0		53 -

44 3.9 (44 48) 44 63.7

10	43	51	-12	45	38 -
11		60	-2		41 +1
12		81	+18		25 -17
13		49	-14		42 +1
14		63	+1		38 -4
15		68	+5		43 +5
16		68	+5		39 -4
17					

43 63.0 45 39.7

44 51.5

Zero — 44 50.2

Rods "Staats Emerald Green. A "E.g.A" hexagonal b mean Violet, b a little more yellow than this disc."

1	44	38	−	22	44	50	+	28
2		39	+	33		39	+	23
3		40	+	1		33	+	17
4		43	+	1		36	+	20
5		40	−	1		33	+	17
6		39	−	1		32	+	16
7		41	−	9		40	+	24
		58				43		
	44	39.7	(44	6.0)	44	42.4		

Colour sense

1	44	32		9	44	64	−	1
2		44	+	1		66	−	3
3		34	+	7		68	−	5
4		30		2		62	−	1
5		27	−	2		57	+	4
6		27	−	5		61	+	8
7		15	−	7		69	+	16
		22				76		
	44	32.1			44	65.9		

Blue sense

	44	49.0
Zero	44	55.0

	11.2
	5.4
24	269
	11.6
	9.8

Prob error ± 0058

	49.7
	44.1
	122.1
	61.0

13	112
	9.33
	7.68

Thomson Landolt Exp ± .0046

	32.1
	65.9
	98.0
	49.0

	18.7
	16.9
	17.8
	1.010

Rods "Fundamental blue violet. 4m 18.75

1.010

Prob error
= 0053

34
54
108
66
24)254
10.6
8.96

61.0
37.7
98.7
49.35

13.0
85.1
38.1
49.05

Rood's "Fundamental blue violet. April 1875
made with Hoffmann's violet no 3 and
artificial ultramarine" mixed with equal
amount of white

1	44°	66′	+	5″	44	32	− 6
2		66	+	2		41	+ 3
3		68	+	7		34	− 5
4		65	−	7		32	− 1
5		66	+	4		36	+ 4
6		66	+	2		34	+ 2
7		51	−	10		36	+ 1
	44	61.0	(44	49.35)	44	38.7	43
1	44	69	−	4	44	38.7	+ 2
2		17	+	4		37	− 6
3		00	+	13		36	+ 2
4		66	+	23		35	− 1
5		66	+	23		36	+ 2
6		54	−	19		40	+ 5
7		50	−	17		40	+ 4
	44	13.0	(44	49.05)	44	38.1	34

Zero — 44 49.2

Roods °Arming B. No 1. [96]

1	44°	7	1′	−	5	44	34
2		8	0	+	4		5
3		7	4	+	1		3
4		8	6	+	1		5
5		5	6	−	1		4
6		4	8	+	1		2
7		8	9	+	1		4
8		5	4	+	1		3
9		6	6	+	1		2
10		2	5	−	1		2
11		6	7	+	1		5
12		7	8	−	1		5
13							41

Stable

98 9 492

44 76.1 (44.57.0) 37,8

93

76.1		119
37.8		93
113.9		26
56.8		
	.883	5.15
19.11	7,146	80
1.011		

For error = 0.01 ft.

Roods "Trench water olive shrewn yell. 1. in Whatman's paper. No 3. A.

Roods "French water color chrome yell. 1. in Whatman's paper. No 3. A.
"Yel A. 1"

1	44	25	−	11	44	43	− 8
2		46	+	10		54	+ 3
3		40	+	4		50	+ 2
4		48	+	12		53	+ 7
5		39	+	3		44	+ 6
6		49	+	13		62	+ 9
7		25	−	1		57	+ 1
8		36		10		46	+ 4
9		31	−	5		45	+ 1
10		43	+	7		50	+ 5
11		34	−	2		50	+ 0
12		19	−	17		55	+ 5
13		43	+	7		65	+ 10
14		27	−	9		50	+ 8

505 180

44 36.1 (49° 43') 44 15.13

11.4 7.8

Prob err. ± .0037

36.1
5.13
31.4
43.7

76
1,005

Roods "B Purple Hoffmanns Violet RRR No 68"

± .0087

9.8
7.6
26) 174
6.69
5.65
± .0033

Road "B Purple Hoffmann's Violet"
RRR No 68"

| | | |

Feb 15

Green	0032	16	2
Red	0034	17	1
Violet	0032	18	1
Yellow	0036	30	4
	0035	2)63	2)8
		.0007	.0002
		.0006	3
		.0006	2
		.0005	

Feb 6 Prof counts

White	.0041	1
Red	.0046	6
Yellow	.0032	8
Mean	.0040	2)15
		7.5
		±.0006 ±.0002

Green Yellow Green

Feb 7

Red	.0040	0
Green	.0046	6
Carmine	.0044	2
Yellow	.0037	7
Purple	.0033	3
Mean	.0040	2)18
		4.5
		±.0004 ±.0001

Feb 13

Red	.0048	8
Green	.0034	4
Violet	.0043	3
Yellow	.0032	2
Mean	.0040	2)17
		8.5
		±.0005 ±.0002

Feb 14

Dandelion	.0030	−1
Forsythia	.0030	−1
Blue	.0037	+6
Purple	.0025	−3
Orange	.0032	+1
Mean	.0031	2)2
		1
		.0005

Feb 13 Daytime

136

Negligible
disturbance

Stand adjust before

1	44	42	+	29	44	102	+ 1 1
2		24	+	11		92	+ 1 5
3		12	−	11		68	+ 1 5
4		24	−	9		80	+ 1 7
5		18	+	5		88	+ 1 6
6		16	+	3		86	+ 1 7
7		22	+	1		86	− 1 5
8		21	+	8		94	− 1 3
9		12	−	1		88	− 1 3
10		11	−	23		88	− 1 3
11		23	+	10		99	− 1 5
12		2	−	15		79	− 1 2
13		9	−	22		57	− 2 9
14		4	−	9		81	− 1 0
		178				1354,5	117

Mean 136

44 81,1

Mean 12,7

12,7
9,1
103,8

136
117
253

44 05 19 Zero

973
8,22

= 1,0048

Our carriage No. 37

Ongs carmine No 37
Engs Prussian Cobalt blue

| | | |

5.75
+1.0034

Blue Violet No 2 made with artificial ultramarine in powder
Blue Violet B No 56

144 88 144 139

1 2 3 4 5 6 7 8 9 10 11 12 13

too dark Can do nothing with it.

The same with about 30°

This makes a beautiful light robe. Very fine for photometry, and would

The same with Green 30°

| | | |

Yellow and white striped tulip
Brown and Burnt
Tulips much as
more shimmering
than with this color

Yellow and white striped tulip

| | | |

$\pm .0031$

Values Measured

Feb 7	Red	424	50.2
	Green		49.0
	blue violet		48.2
	Carmine		51.0
	Yellow		43.7
	Purple		52.2
Feb 13	Red		51.9
	Bluish green		57.4
	Violet		49.6
	Yellow		49.6

Tele up
Boring random flood

1	44	30	+1	44	64	−1					
2		26	−3		75	+10					
3		40	+11		66	+1					
4		25	−4		65	+12					
5		26	−3		52	−12					
6		16	−13		71	+6					
7		22	−6		79	+8					
8		33	+3		66	+1					
9		32	+7		65	+19					
10		36	−1		74	+9					
11		27	−2		53	−11					
12		32	+3		55	+2					
13		03	+11		46	−9					
14		293	68		646	88					

6.00
5.07
±.0030

2.93
6.45
53.8
4.0 46.9 zero

Borrow formed by red
Yellow & black

1	44	0	88	81	−3				55	+18	
2			85	86	+1				33	−4	
3			92	94	+8				41	+4	
4			84	84	0				42	+5	
5			82	80	−2				47	+4	
6			87	92	+5				45	+8	
7			78	72	−6				32	−5	
8			88	92	+4				33	−4	
9			79	74	−5				35	−1	
10			86	90	+4				39	+2	
11			93	97	+4				37	0	
12			72	60	−12				33	−4	
13			68	72	+4				36	−1	
14			77	70	−7				11	−26	
			840	70	604				367	86	

6.00
5.07
±.0030

840
367
120.7
4.0 60.3 = zero

a valley ground sloping [illegible] composed of clay with (5/16) boulders (complementary of earning) (11/16) & rock (11/16)

44° 49	− 9
49	− 9
59	+ 1
53	− 5
59	+ 1
54	− 4
73	+ 15
50	− 8
53	− 5
67	+ 9
61	+ 3
72	+ 14
52	− 6
67	+ 9
44° 59′	+ 5
64	+ 10
54	0
41	− 13
69	+ 15
46	− 8
57	+ 3
53	− 1
56	+ 2
46	− 8
45	− 9
53	− 1
65	+ 11
44	− 10

11 | 784 | 98 | 551′ | 52 | 527 | 96

(5.46)

690

± .0031

a very variable [illegible] mixture of pumice (6/16) & cinders (4/16)

44° 31	− 19
60	+ 10
41	− 9
36	− 4
60	+ 10
51	+ 1
50	0
55	+ 5
56	+ 6
52	+ 2
52	+ 2
53	+ 3
55	+ 5
41	− 9
44° 51	− 9
55	− 5
65	+ 5
64	+ 4
67	+ 7
58	+ 2
56	− 4
64	+ 4
51	− 9
65	+ 5
65	+ 5
63	+ 3
54	− 2
60	0

3 | 508 | 85 | 552 R 601 | 64

(5.73)

4.874

± .0028

a yellow [illegible] mixture of clay, [illegible] & [illegible]

1887 [illegible] Fine clay, sand & [illegible] 8

44° 50	− 1	44° 34	− 17		
47	− 4	52	+ 1		
61	+ 10	54	+ 3		
45	− 6	60	+ 9		
48	− 2	62	+ 11		
48	− 3	57	+ 6		
58	+ 7	55	+ 4		
48	− 3	46	− 5		
49	− 2	47	− 4		
56	+ 5	30	− 21		
54	+ 3	57	+ 6		
51	0	59	+ 8		
41	− 10	59	+ 8		
53	+ 2	46	− 5		
10	507	58	510	18	5.13	108

6.36
5.40
± .0032

44° 36'	+ 4	44° 62'	0		
24	− 8	44	+ 12		
31	− 1	61	− 1		
31	− 1	67	+ 5		
66	+ 34	70	+ 8		
34	+ 2	56	− 7		
27	− 5	57	− 6		
18	− 14	53	− 9		
33	+ 1	57	− 5		
26	− 5	61	− 1		
30	− 2	60	− 2		
22	− 10	58	− 4		
24	− 8	64	+ 2		
35	+ 3	64	+ 2		
17	312	99	466	27	618	57

5.13
± .0030

Wavelength B, half-fringe between C and D

44	20′	−	2
	27	+	5
	24	+	2
	26	+	4
	14	−	6
	21	−	1
	23	+	1
	30	+	8
	19	−	3
	17	−	5
	22		0
	25	+	3
	24	+	2
	24	+	2

24	64′	−	1
	56	+	1
	53	−	11
	55	−	10
	72	+	7
	72	+	7
	67	+	2
	68	+	3
	60		5
	75	+	10
	65		0
	66	+	1
	69	+	4
	65		0

+	3	
+	5	
−	8	
−	6	
+	11	
+	11	
+	8	
+	9	
+	11	
−	4	
+	4	
+	5	
+	7	
	55	

51 222 51 43.60 649 55

61 14

3,4414
± .0020

127

127
51
26)178
5.76
± .0034

Grating
1440

Mercury fundamental blue (with yellow)

73′	−	6
73	−	3
73	−	3
80	+	2
76	−	2
80	+	2
55	−	23
81	+	3
75	+	3
76	+	4
80	+	6
88	+	11
86	+	8
83	+	5

32′	−	2
32	−	2
29	−	1
36	+	1
20		4
31	+	6
16	−	8
25	+	1
32	+	7
29	+	4
33	+	6
27	−	2
06	−	18
17	−	7

107 76 61 24.5 88

5.43
± .0032

Yellow

Poggendorff Annalen CXLIII, 633.
Black with white

±.0034

Symb. black ♀ X hair ahhhh yellow
♂

13	−13		69	−5	
14	−12		74	0	
23	−3		75	+1	
25	−1		81	+7	
23	−3		83	+9	
32	+6		79	+5	
31	+5		74	0	
17	−9		73	−1	
39	+13		66	−8	
36	+10		79	+5	
33	+7		72	−2	
34	+8		62	−12	
28	+2		88	+14	
13	−13		60	−14	
81	258	105	449	55	739	83

6.11
±.0036

Pogg. Ann. CXLIII, G 33.
Black with white

Scale up			Scale Down		
1	14	5	15	38	
2	16	5	10	28	
3	16	5	10	28	
4	13	4	5	7	4	38
5					

14	5		14	22
14	5		15	26
14	5		13	28
13	4	5	15	22
	23			158
14	13		14	40

121° 26'

Ratio of black to white } 8.821 / .0664

Carmine R with white

Blue violet R with white

Carmine B with white

Vernier up		Vernier down	
1	27	6	24
1	59	11	0
2	34	16	36
2	54	21	12
2	34	26	36
	225		63

23.56 — 24.16

24 6

Resistance 0.200

Blue Violet B No 56 with white

1	59	76	50
1	43	163	336
1	02	101	363
1	28	77	18

1	59	13	10
1	16	13	24
1	38	11	38
1	25	12	42
	118		69
	96		42
	2478		
	120		

12.00 — 12.42

12 21

8.6807

.048

Same blue violet

Same blue/violet with black

1326	53	1833	3505
1327	27	1257	5827
51	54	52	
		40	25
	3	43	10
42	33	37	58
41	54	34	55
	DT8	37	48
41	54	9	52
		39	52

40 53

9 8748

PS of black

this singe black is OGC

to (on Pilot This would be

.019 of white. By touch

measure it is .048

$D \log(\sin x) = \frac{1}{\tan x} \cos^2 = \sin x \cos x$

$\sin^{-1} \cos^{-1}$

$D \sin^m \cos^n$

$m \sin^{m-1} \cos^{n+1} - n \sin^{m+1} \cos^{n-1}$

$D^2 =$

$m(m-1) \sin^{m-2} \cos^{n+2}$

$-mn$

$D \sin^{-1} \cos^{-1}$

$= -\sin^{-2} + \cos^{-2}$

$D^2 = +2 \sin^{-3} \cos + 2 \cos^{-3} \sin$

$D^3 = -6 \sin^{-4} \cos^2$

$- 2 \sin^{-2}$

$+ 2 \cos^{-2}$

$+ 6 \cos^{-4} \sin^2$

$D^n = 24 \sin^{-5} \cos^3 + 12 \sin^{-3} \cos$

$+ 6 \cos^{-1} \sin^{-5}$

$D^4 = 24 \sin^{-5} \cos^3 + 12 \sin^{-3} \cos$
$+ 4 \sin^{-3} \cos + 4 \cos^{-3} \sin$
$+ 24 \cos^{-5} \sin^3 + 12 \cos^{-3} \sin$
$- 24 \sin^{-5} \cos + 16 \sin^{-3} \cos$
$+ 16 \cos^{-3} \sin + 24 \cos^{-5} \sin^3$

$D^5 = -120 \sin^{-6} \cos \{ -12 \sin^{-4} \cos^2$
$- 16 \sin^{-2} \cdot -120 \{ + 48 \sin^{-4} \cos^2$
$+ 16 \cos^{-2} \quad + 48 \cos^{-4} \sin^2$
$+ 120 \cos^{-6} \sin^4 \{ + 12 \cos^{-4} \sin^2$

$D^6 = 120 \sin^{-7} \cos^5 + 480 \sin^{-5} \cos^3$
$+ 240 \sin^{-3} \cos + 480 \sin^{-5} \cos^3$
$+ 32 \cos^{-3} \cos + 32 \cos^{-3} \sin$
$+ 480 \cos^{-5} \sin^3 + 240 \cos^{-3} \sin$
$+ 480 \cos^{-5} \sin^3 + 72 \cos^{-7} \sin^5$

1452
3904

$D = \frac{G^4}{1+6^4}$

$$D = \frac{6^4}{1+6^{2y}}$$

$$D^1 = \frac{6^4+6^{3y}-2\,6^{3y}}{1+2\,6^{2y}+6^{4y}} = \frac{6^4-6^{3y}}{(1+6^{2y})^2}$$

$$D^2 = \frac{(6^4-3\,6^{3y})(1+6^{2y})}{(1+6^{2y})^2}$$

$$= \frac{6^4(1-6^{2y})}{(1+6^{2y})^2}$$

$$D^3 = \frac{(6^4(1-6^{2y})-2\,6^{3y}6^{2y})(1+6^{2y})^2}{(1+6^{2y})^4}$$

$$D^3 = 6^4(1-3\,6^{2y})(1+6^{2y})$$

$$-2(1+6^{2y})6^{3y}6^{2y}(1-6^{2y})$$

$$(1+6^{2y})^3$$

$$6^4-6\,6^{4y}+6\,6^{8y}$$

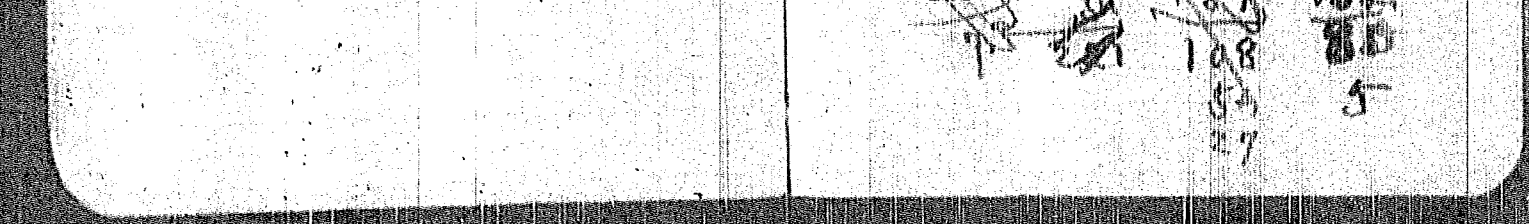
$$D^4 = (6^4-18\,6^{4y}+5\,6^{8y})(1+6^{2y})$$

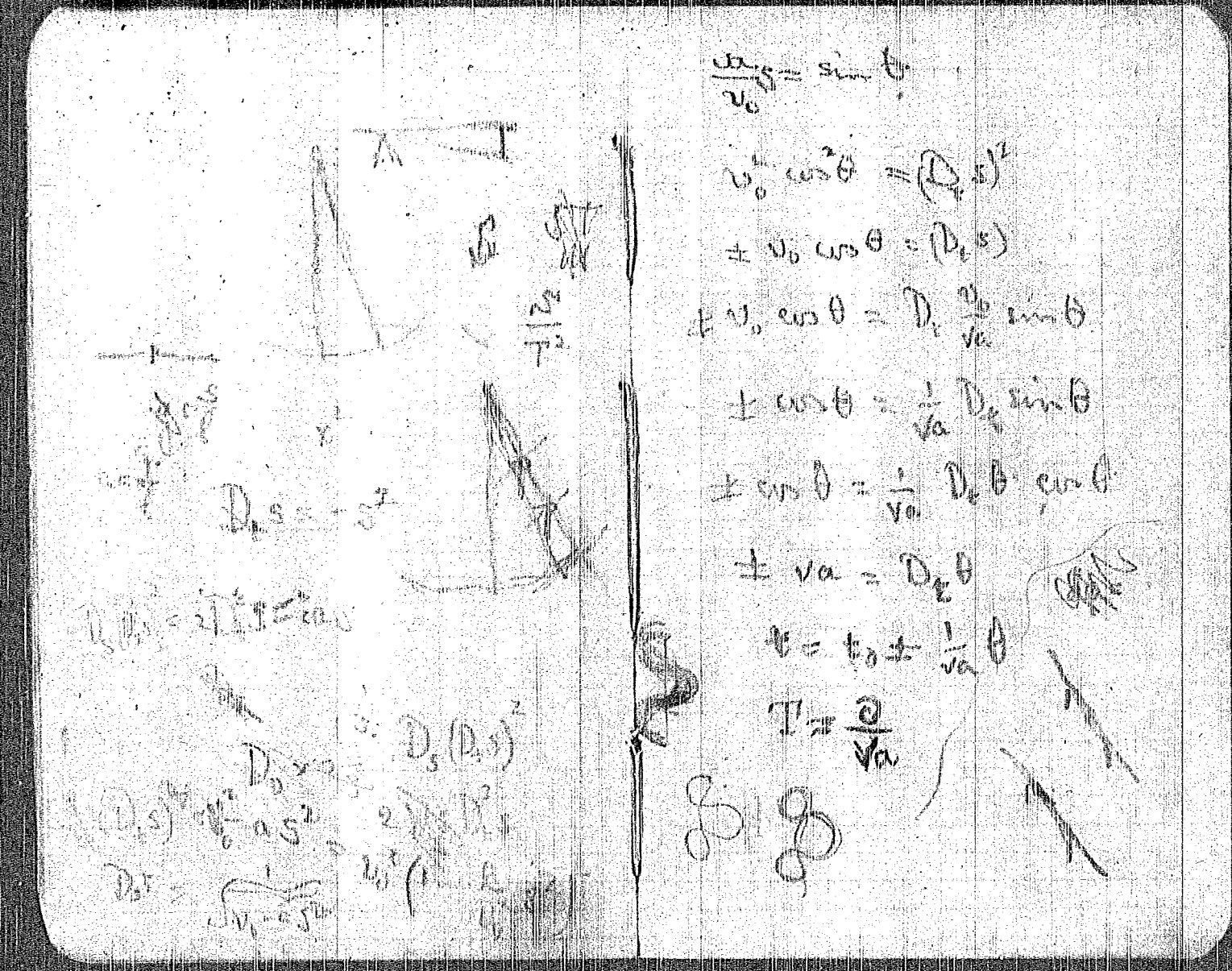
$$-6(6^4-5\,6^{4y}+6^{8y})(1-6^{4y})$$

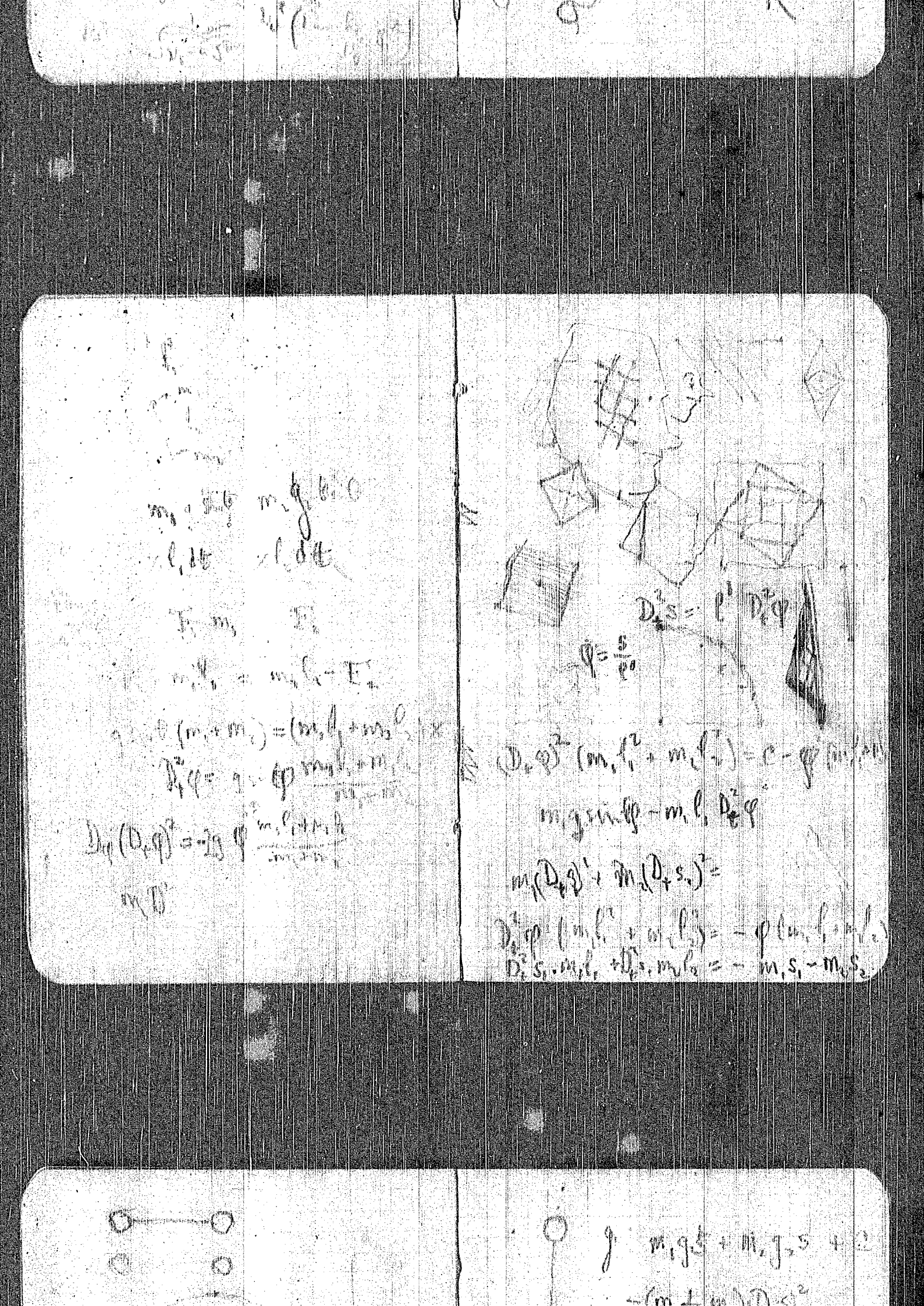
$$(1+6^{2y})^4$$

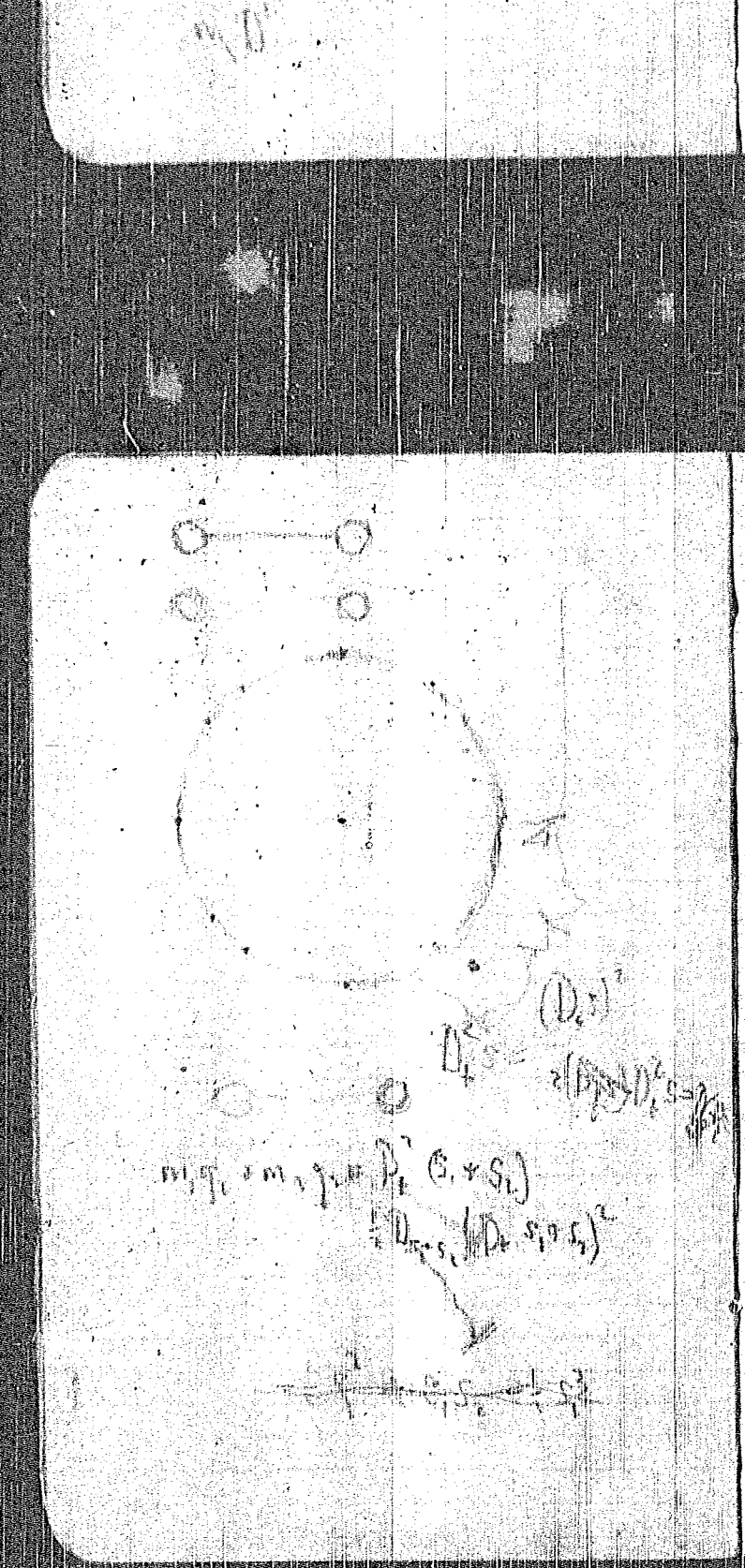
$$6^4-18\,6^{4y}+5\,6^{8y}$$

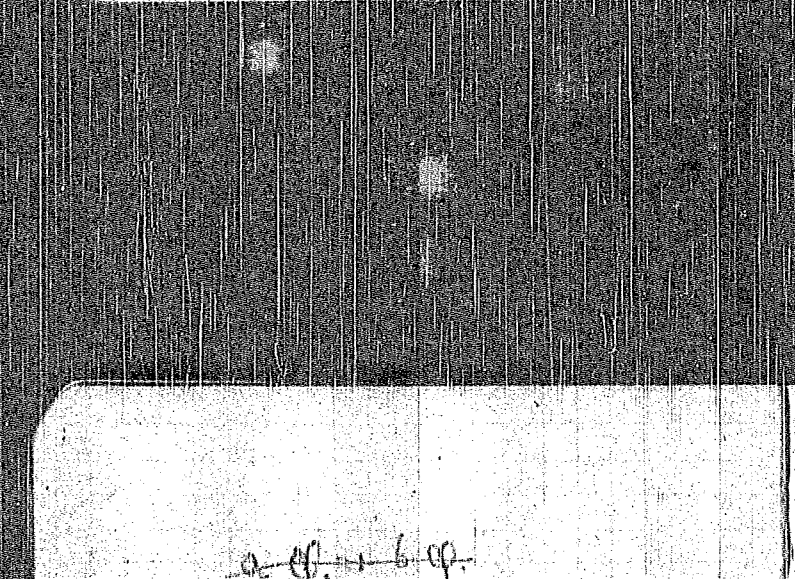
$$+6^{4y}-18\,6^{8y}+5\,6^{12y}$$













$m_1 g s_1 + k(s_2 - s_1) s_1$

$m_2 g s_2 + k(s_2 - s_1) s_2$

$(0,5)^2 = m_1 g s_1 - k(s_1^2 - s_1 s_2)$

$(0,5)^2 = m_2 g s_2 + k(s_2^2 - s_1 s_2)$

$a_1 p + a_2 q = b_1 p + b_2 q$

$a_1 q \quad = \quad c_1 p + c_2 q$

$\frac{a_1 \frac{p}{q} + a_2}{a_1} = \frac{b_1 \frac{p}{q} + b_2}{c_1 \frac{p}{q} + c_2}$

$A c_1 x^2 + (A c_2 - b_1) x = b_2$

$x^2 + \left(\frac{c_2}{c_1} - \frac{b_1}{A c_1}\right) x = \frac{b_2}{A c_1}$

$x^{1,2} = \frac{1}{2}\left(\frac{b_1 a_1}{c_1 a_1} - \frac{c_2}{c_1}\right) \pm \sqrt{\frac{b_2}{a_1 c_1} + \left(\frac{b_1 a_1}{c_1 a_1} - \frac{c_2}{c_1}\right)^2}$

$\varphi_1 \quad \varphi_2 \quad R s_1 - l_2 s_1$

$l_1 \quad s_1 \quad s_2 \quad \frac{s_1}{l_1} = \frac{s_2}{l_2}$

$m_1 \quad \varphi = \frac{s}{l}$

$l_1 m_1 D_t^2 \varphi_1 = -m_1 g \varphi_1 + k(\varphi_2 - \varphi_1)$

$l_2 m_2 D_t^2 \varphi_2 = -m_2 g \varphi_2 + k(\varphi_1 - \varphi_2)$

$a_1 = l_1 m_1 \quad b_1 = -m_1 g - k \quad c_1 = k$

$a_2 = l_2 m_2 \quad b_2 = k \quad c_2 = -m_2 g - k$

$-m_1 m_2 g l_2 - k l_1 m_2$

$+ m_1 m_2 g l_1 + k l_1 m_1$

$l_1^2 m_1 D_t^2 \varphi_1 = -m_1 g s_1 + k(l_1 \varphi_2 - s_1)$

$l_1 \varphi_1$

$$\frac{1}{2}\left(1 + 3\frac{1}{2^2} + 5\frac{2}{2^5}\right)$$

$$\frac{1}{2}\left(1 + 3\frac{1!}{2^2} + 5\frac{2!}{2^4}\right)$$

$$\frac{1}{2}\sum_{0}^{\infty}(2p+1)\frac{p!}{2^p}4^{-p}$$

$$\frac{1}{2}\sum_{0}^{\infty}\left(p\cdot p!4^{-p} + (p+1)!4^{-p}\right)$$

$$+2\sum_{0}^{\infty}(2p+1)p!4^{-(p+1)}$$

$$(p+1)!4^{-p}$$

$$p!4^{-p} = D_p$$

$$x^{-1}$$

$$= x^{-2}$$

$$+2x^{-3}$$

$$+3!x^{-4}$$

$$\frac{1}{2}\sum_{0}^{\infty}(2m+1)m!\left(\frac{1}{4}\right)^m(p<1-p)^m$$

$$1 + \frac{3}{4} + \frac{10}{16} + \frac{42}{64}$$

$$\frac{1}{1} \quad \frac{2}{16} \quad \frac{6}{64} \quad \frac{24}{256} \quad \frac{120}{1024}$$

OXOXOX

OXOUXX

OOXOOXX

OOOXXXX

OOOXOXX

OOXOOXX

OXOOOXX

1 2 6 24 120
4 16 64 256 1024

720 5040 40320
4096 16384 65536

$f_2 = 2 \times f_1$

$f_3 = 1 + 2 + 2$

$f_4 = 2 + 2 + 3$

$f_5 =$

$\frac{(2n)!}{n!2(n+1)}$ $\frac{(\frac{1}{2}n)!}{}$ 354

$\frac{n(n-1)}{2}$ $\frac{2!}{1}$

$2n = \frac{4!}{2!}$

1 1

2 3 6 13 24 43 74

5 9 19 30 57

14 28 62 102

42 90 207

132 297

429

$\frac{120}{6}$ 20

720 144

$p^2 = 316 - 55$

765432 6 5 4 3 2

65432 5 4 3 2

5432 4 3 2

432 3 2

32

5 4 3 2

4 3 2

3 2

65432 5 4 3 2

5432 4 3 2

432 3 2

32

4 3 2

3 2

5 4 3 2 6 7 70

4 3 2 7×4 36

3 2 4×5 20

5 6

132

1 2 5

3 7 18 35 96

10 25 66 179

35 91 245

1 4 15 56 210 792

1 5 21 84 330 1287

6 28 126 495

7 36 165

8 45

9

1 2 3 4 5 6 7 8

1 3 6 10 15 21 28 36

1 4 10 20 35 56 84

1 5 15 35 70 126

1 6 21 56 126

1 7 28 84

1 8 36

1 9

1 2 3 4 5 6 7 8

1 3 6 10 15 21 28 36

1 4 10 20 35 56 84 120

1 5 15 35 70 126 210

1 6 21 56 126 252 462

1 7 28 84 210 462 924

1 8 36 120 330 792 1716

1 9 45 165 495 1287 3003

1 10 55 220 715 2002 5005

1 11 66 286 1001 3003 8008

1 12 78 364 1365 4368 12376

1 13 91 455 1820 6188 18564

1 14 105 560 2380 8568 27132

1 15 120 680 3060 11628 38760

1 16 136 816 3876 15504 54264

1 17 153 969 4845 20349 74613

1 18 171 1140 5985 25194 99807

1 19 190 1330 7315 31179 130986

1 20 210 1540 8855 38494 169480

1 21 231 1771 10626 47320 207800

1 22 253 2024 12650 57970 277770

1 23 276 2300 14950 70620 348390

1 24 300 2600 17550 85570 419010

1 25 325 2925 20475 103120 489630

1 26 351 3276 23751 123595 560250

1 27 378 3654 27405 147346 630870

1 28 406 4060 31465 174751 701490

1 29 435 4495 35960 206216 772110

1 30 465 4960 40920 242176 842730

1 31 496 5456 46376 283096 913350

1 32 528 5984 52360 329472 983970

1 33 561 6545 58905 381832 1054590

1 34 595 7140 66045 440737 1125210

1 35 630 7770 73815 506782 1195830

1 36 666 8436 82251 580597 1266450

1 37 703 9139 91387 662848 1337070

1 38 741 9880 101266 754234 1407690

1 39 780 10660 111946 855480 1478310

1 40 820 11480 123480 967360 1548930

1 41 861 12341 135821 1090680 1619550

1 42 903 13244 149065 1226245 1690170

1 43 946 14190 163309 1375310 1760790

1 44 990 15180 178499 1538619 1831410

1 45 1035 16215 194679 1717118 1902030

1 46 1081 17296 211894 1911797 1972650

1 47 1128 18424 230190 2123691 2043270

1 48 1176 19600 249614 2353905 2113890

1 49 1225 20825 270214 2603519 2184510

1 50 1275 22100 292039 2873733 2255130

1 51 1326 23426 315139 3164772 2325750

1 52 1378 24804 339565 3478911 2396370

1 53 1431 26235 365370 3818476 2466990

1 54 1485 27720 392605 4184846 2537610

1 55 1540 29260 421325 4579451 2608230

1 56 1596 30856 451581 5002776 2678850

1 57 1653 32509 483430 5456357 2749470

1 58 1711 34220 516930 5941787 2820090

1 59 1770 35990 552140 6460717 2890710

1 60 1830 37820 589120 7013857 2961330

1 61 1891 39711 627931 7602988 3031950

1 62 1953 41664 668635 8229963 3102570

1 63 2016 43680 711299 8895698 3173190

1 64 2080 45760 755989 9601187 3243810

1 65 2145 47905 802774 10347496 3314430

1 66 2211 50116 851724 11135770 3385050

1 67 2278 52394 902910 11967234 3455670

1 68 2346 54740 956404 12843188 3526290

1 69 2415 57155 1012279 13765017 3596910

1 70 2485 59640 1070609 14734196 3667530

1 71 2556 62196 1131469 15752285 3738150

1 72 2628 64824 1194935 16820934 3808770

1 73 2701 67525 1261084 17941869 3879390

1 74 2775 70300 1329994 19116913 3950010

1 75 2850 73150 1401744 20347977 4020630

1 76 2926 76076 1476414 21636071 4091250

1 77 3003 79079 1554085 22982306 4161870

1 78 3081 82160 1634839 24387891 4232490

1 79 3160 85320 1718759 25854130 4303110

1 80 3240 88560 1805929 27382429 4373730

1 81 3321 91881 1896434 28974293 4444350

1 82 3403 95284 1990362 30631327 4514970

1 83 3486 98770 2087800 32355239 4585590

1 84 3570 102340 2188840 34147839 4656210

1 85 3655 105995 2293575 36010034 4726830

1 86 3741 109736 2402099 37943833 4797450

1 87 3828 113564 2514505 39950348 4868070

1 88 3916 117480 2630889 42030793 4938690

1 89 4005 121485 2751344 44186482 5009310

1 90 4095 125580 2875969 46418826 5079930

1 91 4186 129766 3004859 48729345 5150550

1 92 4278 134044 3138113 51119658 5221170

1 93 4371 138415 3275828 53591486 5291790

1 94 4465 142880 3418108 56146654 5362410

1 95 4560 147440 3565048 58786102 5433030

1 96 4656 152096 3716744 61511846 5503650

1 97 4753 156849 3873293 64325139 5574270

1 98 4851 161700 4034793 67227432 5644890

1 99 4950 166650 4201343 70220775 5715510

1 100 5050 171700 4373043 73305818 5786130

1 101 5151 176851 4549994 76484812 5856750

1 102 5253 182104 4732298 79759606 5927370

1 103 5356 187460 4920058 83131704 5997990

1 104 5460 192920 5113378 86603262 6068610

1 105 5565 198485 5312363 90176025 6139230

1 106 5671 204156 5517119 93852344 6209850

1 107 5778 209934 5727753 97634197 6280470

1 108 5886 215820 5944373 101524170 6351090

1 109 5995 221815 6167088 105524558 6421710

1 110 6105 227920 6396008 109637366 6492330

1 111 6216 234136 6631244 113865374 6562950

1 112 6328 240464 6872908 118211082 6633570

1 113 6441 246905 7121113 122677795 6704190

1 114 6555 253460 7375973 127268568 6774810

1 115 6670 260130 7637603 131987171 6845430

1 116 6786 266916 7906119 136837290 6916050

1 117 6903 273819 8181638 141822928 6986670

1 118 7021 280840 8464278 146948206 7057290

1 119 7140 287980 8754158 152217364 7127910

1 120 7260 295240 9051398 157634762 7198530

1 121 7381 302621 9356119 163204881 7269150

1 122 7503 310124 9668443 168932324 7339770

1 123 7626 317750 9988493 174821817 7410390

1 124 7750 325500 10316393 180878210 7481010

1 125 7875 333375 10652268 187105478 7551630

1 126 8001 341376 10996244 193508722 7622250

1 127 8128 349504 11348448 200093170 7692870

1 128 8256 357760 11709008 206864178 7763490

1 129 8385 366145 12078053 213827231 7834110

1 130 8515 374660 12455713 220987944 7904730

1 131 8646 383306 12842119 228352063 7975350

1 132 8778 392084 13237403 235925466 8045970

1 133 8911 400995 13641698 243714164 8116590

1 134 9045 410040 14055138 251724302 8187210

1 135 9180 419220 14477858 259962160 8257830

1 136 9316 428536 14909994 268434154 8328450

1 137 9453 437989 15351683 277146837 8399070

1 138 9591 447580 15803063 286106900 8469690

1 139 9730 457310 16264273 295321173 8540310

1 140 9870 467180 16735453 304796626 8610930

1 141 10011 477191 17216744 314540370 8681550

1 142 10153 487344 17708288 324559658 8752170

1 143 10296 497640 18210228 334861886 8822790

1 144 10440 508080 18722708 345454594 8893410

1 145 10585 518665 19245873 356345467 8964030

1 146 10731 529396 19779869 367542336 9034650

1 147 10878 540274 20324843 379053179 9105270

1 148 11026 551300 20880943 390886122 9175890

1 149 11175 562475 21448318 403049440 9246510

1 150 11325 573800 22027118 415551558 9317130

1 151 11476 585276 22617494 428401052 9387750

1 152 11628 596904 23219598 441606650 9458370

1 153 11781 608685 23833583 455177233 9528990

1 154 11935 620620 24459603 469121836 9599610

1 155 12090 632710 25097813 483449649 9670230

1 156 12246 644956 25748369 498170018 9740850

1 157 12403 657359 26411428 513292446 9811470

1 158 12561 669920 27087148 528826594 9882090

1 159 12720 682640 27775688 544782282 9952710

1 160 12880 695520 28477208 561169490 10023330

1 161 13041 708561 29191869 577998359 10093950

1 162 13203 721764 29919833 595279192 10164570

1 163 13366 735130 30661263 613022455 10235190

1 164 13530 748660 31416323 631238778 10305810

1 165 13695 762355 32185178 649938956 10376430

1 166 13861 776216 32967994 669133950 10447050

1 167 14028 790244 33764938 688834888 10517670

1 168 14196 804440 34576178 709052066 10588290

1 169 14365 818805 35401883 729796949 10658910

1 170 14535 833340 36242223 751080172 10729530

1 171 14706 848046 37097369 772913541 10800150

1 172 14878 862924 37967493 795309034 10870770

1 173 15051 877975 38852768 818278802 10941390

1 174 15225 893200 39753368 841835170 11012010

1 175 15400 908600 40669468 865990638 11082630

1 176 15576 924176 41601244 890757882 11153250

1 177 15753 939929 42548873 916148755 11223870

1 178 15931 955860 43512533 942175288 11294490

1 179 16110 971970 44492403 968849691 11365110

1 180 16290 988260 45488663 996184354 11435730

1 181 16471 1004731 46501494 1024191848 11506350

1 182 16653 1021384 47531078 1052884926 11576970

1 183 16836 1038220 48577598 1082276524 11647590

1 184 17020 1055240 49641238 1112379762 11718210

1 185 17205 1072445 50722183 1143206945 11788830

1 186 17391 1089836 51820619 1174770564 11859450

1 187 17578 1107414 52936733 1207083297 11930070

1 188 17766 1125180 54070713 1240158010 12000690

1 189 17955 1143135 55222748 1273997758 12071310

1 190 18145 1161280 56393028 1308614786 12141930

1 191 18336 1179616 57581744 1344022530 12212550

1 192 18528 1198144 58789088 1380234618 12283170

1 193 18721 1216865 60015253 1417263871 12353790

1 194 18915 1235780 61260433 1455123304 12424410

1 195 19110 1254890 62524823 1493826127 12495030

1 196 19306 1274196 63808619 1533385746 12565650

1 197 19503 1293699 65112018 1573815764 12636270

1 198 19701 1313400 66435218 1615129982 12706890

1 199 19900 1333300 67778418 1657342400 12777510

1 200 20100 1353400 69141818 1700467218 12848130

$X_{...}$

OXX

OOXXX
OXOXX

$\frac{2m+1}{m+1} \quad \frac{(2m)!}{(m!)^2}$

$(2m+1)\frac{(2m)!}{(m+1)!\,m!}$

$P\sum_0^\infty \frac{(2m+1)!}{(m+1)!\,m!}(p(1-p))^m$

1 2 5
3 7 12 35 96
10 25 48 131
35 91 246 179
126 336 245
462

1 3 2 6
2 5 6 20
3 7 12 42
4 9 20 72
5 11 30 110
6 13 42 156

15
26
150

6
132
30

Exponential Curves

$D_x = \frac{a_x}{}$

Equipotential Curves

$$D_x x = -\frac{ax}{(x^2+y^2)^{\frac{3}{2}}}$$

$$(D_x x)^2 = \frac{x}{(x^2+y^2)^{\frac{3}{2}}}$$

$$D_x = 2 D_x x$$

$$D_x (D_x x)^2 = 2 D_x^2 x$$

$$(D_x x)^2 = 2 \int D_x^2 x + C$$

$$(D_x x)^2 = \frac{2a}{\sqrt{x^2+y^2}} + f y$$

$$(D_y y)^2 = \frac{2a}{\sqrt{x^2+y^2}} + f x$$

$$D_x S)^2 = \frac{4a}{\sqrt{x^2+y^2}} + fx + fy$$

$$D_x^2 x = -ax^{-2}$$

$$(D_x x)^2 = ax^{-1}$$

$$D_x^2 x = 0$$

$$x^2 (dx)^2 + y^2 (dy)^2 + 2xy\, dx\, dy$$

$$(x^2+y^2)(dx^2+dy^2)$$

$D_t x = 0$

$x^2(dx)^2 + y^2(dy)^2 + 2xy\,dx\,dy$

$(x^2+y^2)(dx^2+dy^2)$

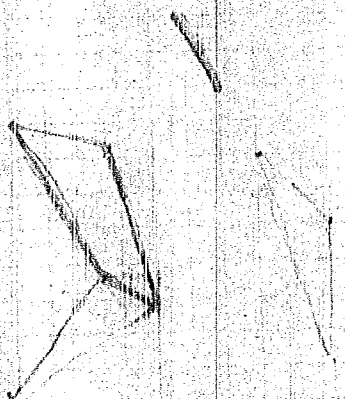
$y^2(dx)^2 + x^2(dy)^2 - 2xy\,dx\,dy = 0$

$x\,dy = y\,dx$

$\frac{dy}{y} = \frac{dx}{x}$

$\ln y + C = \ln x$

$y C = x$



$D_t x$

D_t^2

$D_t(x^2+y^2)$

$\frac{x\,D_t x}{\sqrt{x^2+y^2}} + \frac{y\,D_t y}{\sqrt{x^2+y^2}}$

$D_t(x^2+y^2) =$

$\frac{x^2(D_t x)^2}{x^2+y^2} + \frac{y^2(D_t y)^2}{x^2+y^2} + \frac{2xy\,D_t x\,D_t y}{x^2+y^2}$

$\frac{(x D_t x + y D_t y)^2}{x^2+y^2}$

$(dx)^2 + (dy)^2 = (d(\sqrt{x^2+y^2}))^2$

$d(\sqrt{x^2+y^2}) = \frac{x\,dx + y\,dy}{\sqrt{x^2+y^2}}$

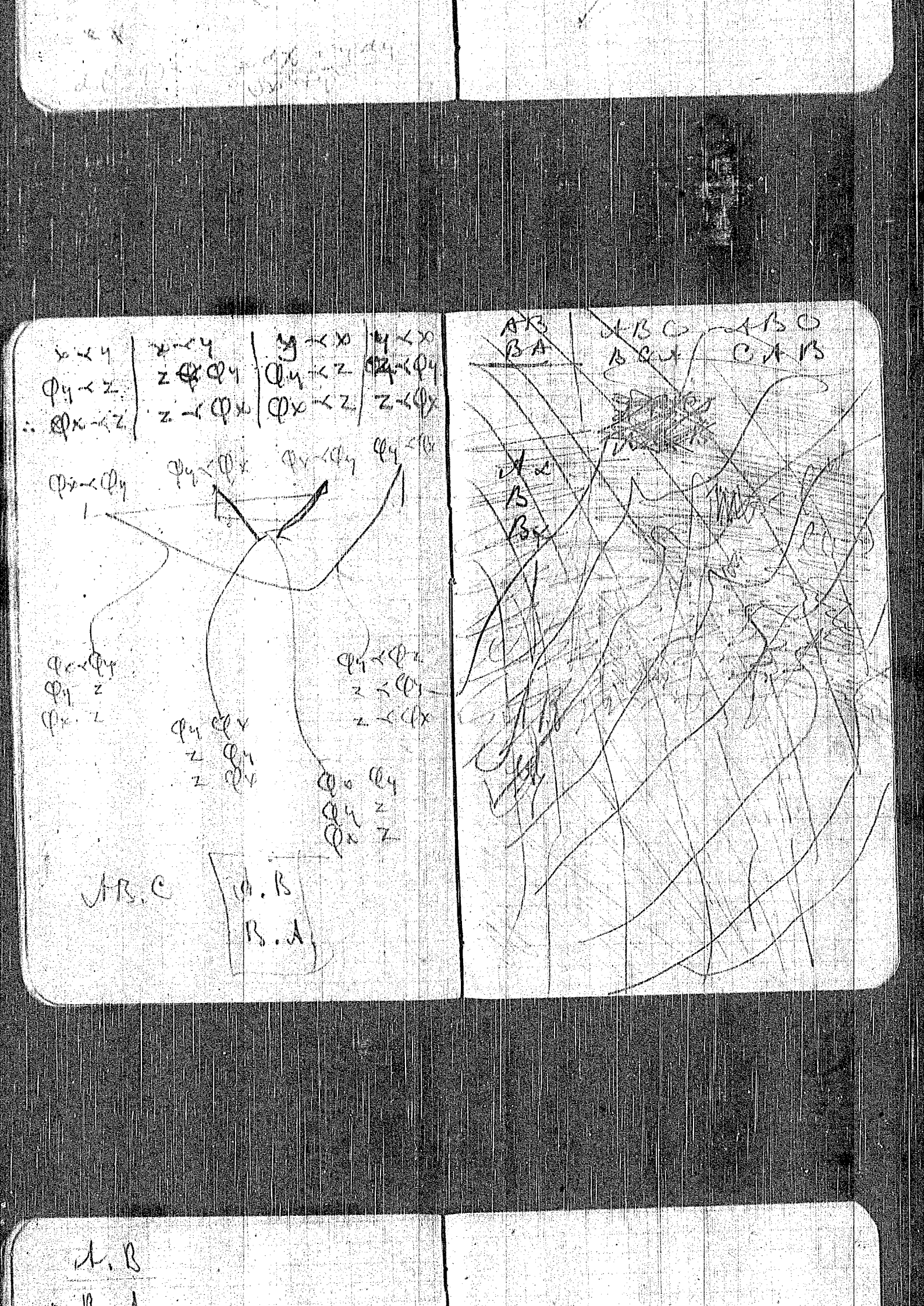
$x < y$ | $x < y$ | $y < x$ | $y < x$

$z \quad Q_4$ | $Q_4 < z$ | $Q_4 < z$

$A \to B$ | $A \to B$ | $A \to B$

$B \to A$ | $B \to C$ | $C \to B$

$B \quad Q_4$ | $C \to A$



$$D \log \tan x = \frac{1}{\tan x} D \tan x$$

$$D \tan x = D \frac{\sin x}{\cos x} = \frac{\cos^2 x + \sin^2 x}{\cos^2 x} = \frac{1}{\cos^2 x}$$

$$D \log \tan x = \frac{1}{\sin x \cos x} = \frac{2}{\sin 2x}$$

$$D^2 \log \tan x = -\frac{4}{(\sin 2x)^2} \cos 2x =$$

$$D^3 \log \tan x = -8 \frac{+(\sin 2x)^2 + (\cos 2x)^2}{(\sin 2x)^4}$$

$$D^3 = -8 \frac{-(\sin 2x)^3 - 2(\sin 2x)(\cos 2x)^2}{(\sin 2x)^4}$$

$$= 8 \frac{\sin 2x (\sin 2x)^2 + 2(\cos 2x)^2}{(\sin 2x)^3}$$

$$2x + 4x^3$$

$$\frac{d}{dx}(\sin(bx)) = b\cos(bx)$$

$$\frac{d}{dx}(\cos(bx)) = -b\sin(bx)$$

$$\frac{d}{dx}(e^{ax}\sin(bx)) = ae^{ax}\sin(bx) + be^{ax}\cos(bx)$$

$$\frac{d}{dx}(e^{ax}\cos(bx)) = ae^{ax}\cos(bx) - be^{ax}\sin(bx)$$

$A:B + B:C = C$

$A:C + C:B + B:A = 0$

$C:A = 0$

$A:B + B:C = C$

$C:A + A:B = 0$

$A:C + C:B + B:A = 0$

$A:B + B:C + C:D = A:D$

$A:C + C:B + B:A = 0$

$A:B + B:C = C$

$C:A + A:B = 0$

$A:B + B:C + C:D + D:E = A:E$

$E:A = 0$

$A:B + B:C + C:D + D:E$

$A:B + B:C + C:D + D:E = i$

$E:A = j$

$i^2 = A:C + B:D + C:E$

$i^3 = A:D + B:E$

$i^4 = A:E$

$i^4 j = A:A$

$i^4 j i = A:B$

$i^4 j i^2 = A:C$

$i^4 j i^3 = A:D$

$1 = i^4 j + i^3 j i^4 j i$

$j = D:A$

$i^2 j = C:A$

$i^3 j = B:A$

$i^4 = A:E$ $\quad i^3 j i = B:B$

$i^2 j i^2 = C:C$

$i^5 = 0$

$i^4 j = B:A$

$i^3 j i = B:B$

$i^2 j i^2 = C:C$

$i j i^3 = D:D$

$j i^4 = E:E$

$1 = i^4 j + i^3 j i + i^2 j i^2 + i j i^3 + j i^4$

$i^5 = 0$

$i^4 = A:E$

$i^4 j = A:A$

$i^3 j = B:A$

$i^2 j = C:A$

$i j = D:A$

$j = E:A$

$i^4 j i = A:B$

$i^3 j i^2 = B:C$

$i^2 j i^3 = C:D$

$i j i^4 = D:E$

$i^4 j i^2 = A:C$

$i^3 j i^3 = B:D$

$i^2 j i^4 = C:E$