

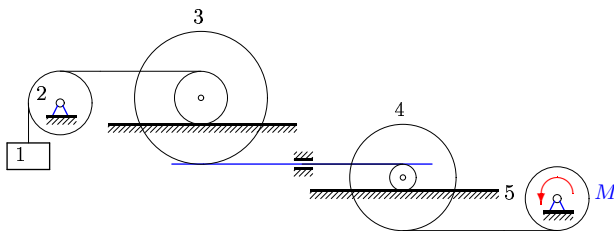
Теорема об изменении кинетической энергии

Механическая система, состоящая из пяти тел 1, 2, 3, 4 и 5, движется под действием внешних сил. Заданы радиусы цилиндров и блоков. Радиусы инерции ρ даны для блоков, цилиндры считать однородными. Горизонтальный стержень, находящийся в зацеплении с блоками, считать невесомым. Массы даны в килограммах, радиусы — в сантиметрах. Найти математическое ожидание скорости груза 1 или центра цилиндра (блока) 1, который опустится по вертикали вниз на случайную величину S с рядом распределения $p = [0.1, 0.4, 0.3, 0.2]$. Приблизительно принять $g = 9.81 \text{ м/с}^2$.

Кирсанов М.Н. Задачи по теоретической механике с решениями в **Maple** 11. – М.: ФИЗМАТЛИТ, 2010. – 264 с. (с.111)

Задача L-24.1.

1

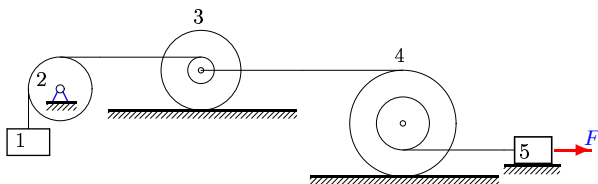


$$\begin{aligned}
 R_3 &= 5, r_3 = 2, \rho_3 = 4, \\
 R_4 &= 4, r_4 = 1, \rho_4 = 3, \\
 m_1 &= 21, m_2 = 6, \\
 m_3 &= 16, m_4 = 96, \\
 m_5 &= 128.
 \end{aligned}$$

$$S = [10.2, 10.4, 10.7, 10.9] \text{ м.}$$

Задача L-24.2.

1

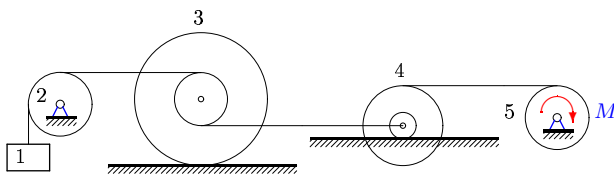


$$\begin{aligned}
 R_3 &= 3, r_3 = 1, \rho_3 = 2, \\
 R_4 &= 4, r_4 = 2, \rho_4 = 3, \\
 m_1 &= 11, m_2 = 10, \\
 m_3 &= 128, m_4 = 1024, \\
 m_5 &= 256.
 \end{aligned}$$

$$S = [2.3, 2.4, 2.7, 2.8] \text{ м.}$$

Задача L-24.3.

1

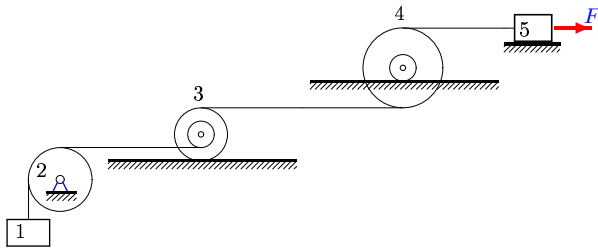


$$\begin{aligned}
 R_3 &= 5, r_3 = 2, \rho_3 = 4, \\
 R_4 &= 3, r_4 = 1, \rho_4 = 2, \\
 m_1 &= 14, m_2 = 4, \\
 m_3 &= 245, m_4 = 196, \\
 m_5 &= 98.
 \end{aligned}$$

$$S = [7.2, 7.5, 7.6, 7.8] \text{ м.}$$

Задача L-24.4.

1

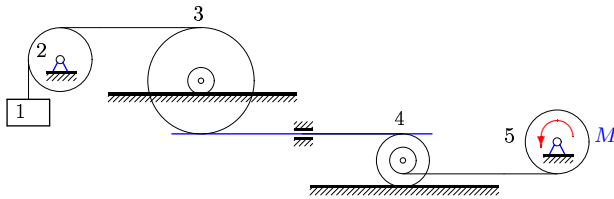


$$\begin{aligned} R_3 &= 2, r_3 = 1, \rho_3 = 1, \\ R_4 &= 3, r_4 = 1, \rho_4 = 2, \\ m_1 &= 13, m_2 = 4, \\ m_3 &= 6, m_4 = 5, \\ m_5 &= 4. \end{aligned}$$

$$S = [8.3, 8.5, 8.6, 8.8] \text{ м.}$$

Задача L-24.5.

1

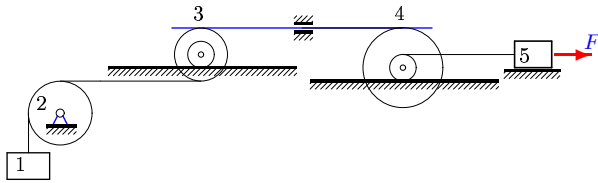


$$\begin{aligned} R_3 &= 4, r_3 = 1, \rho_3 = 3, \\ R_4 &= 2, r_4 = 1, \rho_4 = 1, \\ m_1 &= 11, m_2 = 12, \\ m_3 &= 20, m_4 = 240, \\ m_5 &= 800. \end{aligned}$$

$$S = [2.2, 2.4, 2.6, 2.8] \text{ м.}$$

Задача L-24.6.

1

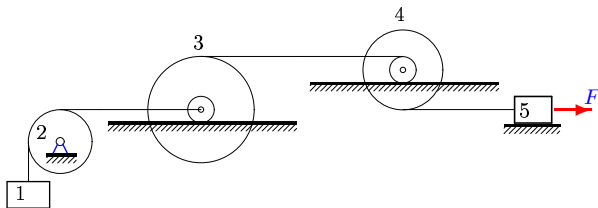


$$\begin{aligned} R_3 &= 2, r_3 = 1, \rho_3 = 1, \\ R_4 &= 3, r_4 = 1, \rho_4 = 2, \\ m_1 &= 15, m_2 = 4, \\ m_3 &= 4, m_4 = 48, \\ m_5 &= 8. \end{aligned}$$

$$S = [6.3, 6.5, 6.6, 6.9] \text{ м.}$$

Задача L-24.7.

1

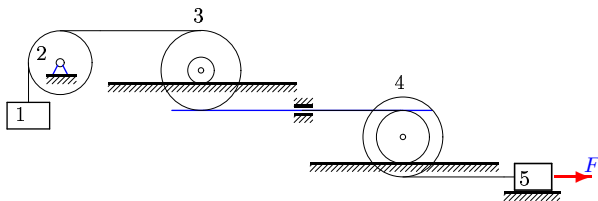


$$\begin{aligned} R_3 &= 4, r_3 = 1, \rho_3 = 3, \\ R_4 &= 3, r_4 = 1, \rho_4 = 2, \\ m_1 &= 20, m_2 = 10, \\ m_3 &= 6, m_4 = 4, \\ m_5 &= 4. \end{aligned}$$

$$S = [10.3, 10.5, 10.6, 10.8] \text{ м.}$$

Задача L-24.8.

1

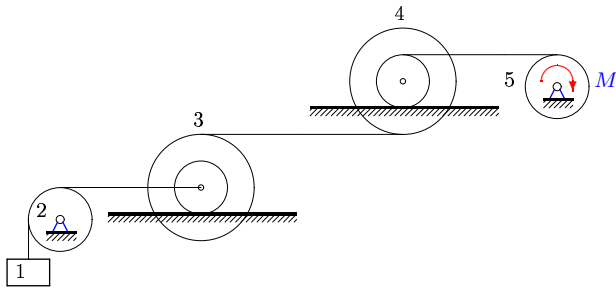


$$\begin{aligned} R_3 &= 3, r_3 = 1, \rho_3 = 2, \\ R_4 &= 3, r_4 = 2, \rho_4 = 2, \\ m_1 &= 23, m_2 = 12, \\ m_3 &= 128, m_4 = 56, \\ m_5 &= 384. \end{aligned}$$

$$S = [10.3, 10.4, 10.7, 10.8] \text{ м.}$$

Задача L-24.9.

1



$$R_3 = 4, r_3 = 2, \rho_3 = 3,$$

$$R_4 = 4, r_4 = 2, \rho_4 = 3,$$

$$m_1 = 18, m_2 = 10,$$

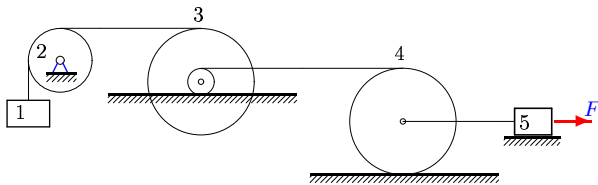
$$m_3 = 16, m_4 = 12,$$

$$m_5 = 4.$$

$$S = [10.3, 10.4, 10.6, 10.8] \text{ М.}$$

Задача L-24.10.

1



$$R_3 = 4, r_3 = 1, \rho_3 = 3,$$

$$R_4 = 4,$$

$$m_1 = 12, m_2 = 6,$$

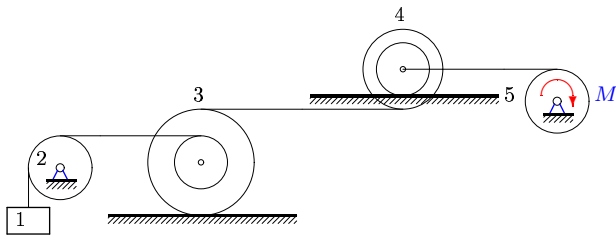
$$m_3 = 30, m_4 = 250,$$

$$m_5 = 100.$$

$$S = [3.3, 3.5, 3.6, 3.8] \text{ М.}$$

Задача L-24.11.

1



$$R_3 = 4, r_3 = 2, \rho_3 = 3,$$

$$R_4 = 3, r_4 = 2, \rho_4 = 2,$$

$$m_1 = 11, m_2 = 2,$$

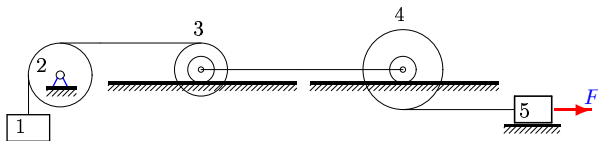
$$m_3 = 144, m_4 = 9,$$

$$m_5 = 36.$$

$$S = [9.2, 9.5, 9.6, 9.9] \text{ М.}$$

Задача L-24.12.

1



$$R_3 = 2, r_3 = 1, \rho_3 = 1,$$

$$R_4 = 3, r_4 = 1, \rho_4 = 2,$$

$$m_1 = 19, m_2 = 4,$$

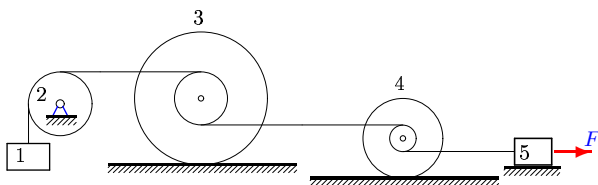
$$m_3 = 54, m_4 = 45,$$

$$m_5 = 36.$$

$$S = [9.3, 9.5, 9.6, 9.8] \text{ М.}$$

Задача L-24.13.

1



$$R_3 = 5, r_3 = 2, \rho_3 = 4,$$

$$R_4 = 3, r_4 = 1, \rho_4 = 2,$$

$$m_1 = 11, m_2 = 10,$$

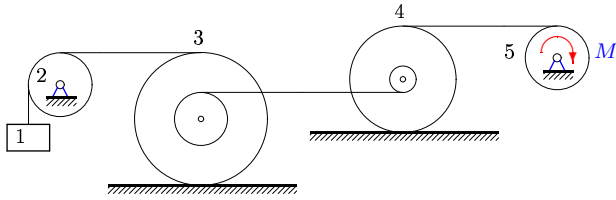
$$m_3 = 196, m_4 = 784,$$

$$m_5 = 196.$$

$$S = [5.3, 5.5, 5.7, 5.9] \text{ М.}$$

Задача L-24.14.

1



$$R_3 = 5, r_3 = 2, \rho_3 = 4,$$

$$R_4 = 4, r_4 = 1, \rho_4 = 3,$$

$$m_1 = 7, m_2 = 6,$$

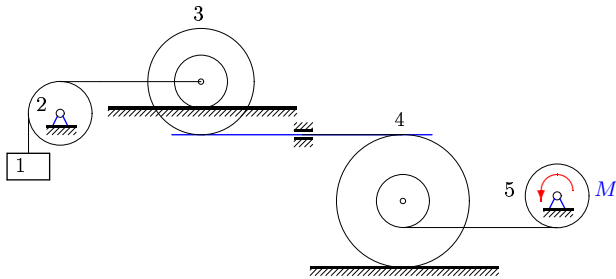
$$m_3 = 100, m_4 = 216,$$

$$m_5 = 450.$$

$$S = [2.2, 2.4, 2.7, 2.8] \text{ м.}$$

Задача L-24.15.

1



$$R_3 = 4, r_3 = 2, \rho_3 = 3,$$

$$R_4 = 5, r_4 = 2, \rho_4 = 4,$$

$$m_1 = 13, m_2 = 8,$$

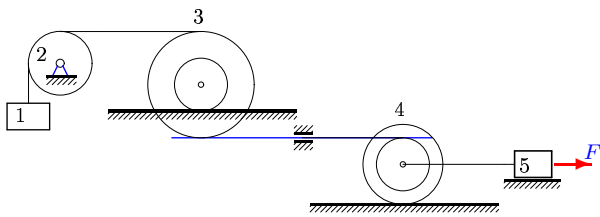
$$m_3 = 20, m_4 = 100,$$

$$m_5 = 200.$$

$$S = [2.2, 2.5, 2.6, 2.8] \text{ м.}$$

Задача L-24.16.

1



$$R_3 = 4, r_3 = 2, \rho_3 = 3,$$

$$R_4 = 3, r_4 = 2, \rho_4 = 2,$$

$$m_1 = 13, m_2 = 12,$$

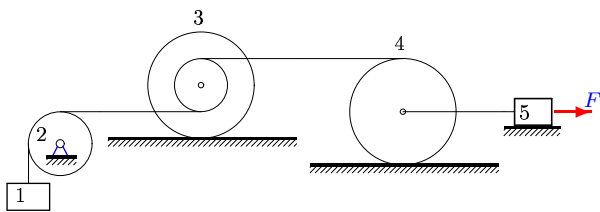
$$m_3 = 144, m_4 = 225,$$

$$m_5 = 50.$$

$$S = [4.3, 4.5, 4.7, 4.9] \text{ м.}$$

Задача L-24.17.

1



$$R_3 = 4, r_3 = 2, \rho_3 = 3,$$

$$R_4 = 4,$$

$$m_1 = 9, m_2 = 10,$$

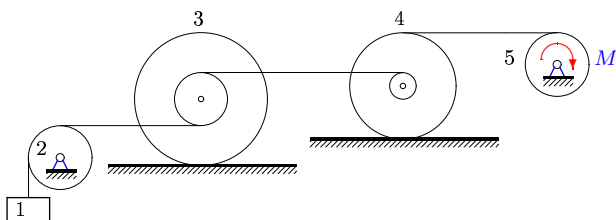
$$m_3 = 16, m_4 = 24,$$

$$m_5 = 8.$$

$$S = [3.3, 3.5, 3.7, 3.8] \text{ м.}$$

Задача L-24.18.

1



$$R_3 = 5, r_3 = 2, \rho_3 = 4,$$

$$R_4 = 4, r_4 = 1, \rho_4 = 3,$$

$$m_1 = 7, m_2 = 6,$$

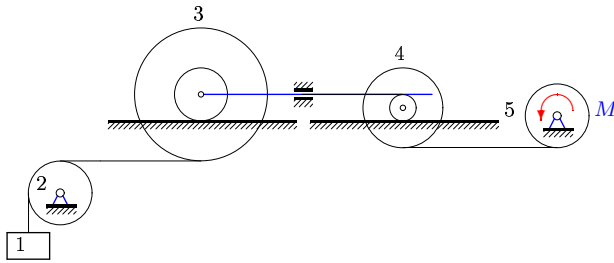
$$m_3 = 36, m_4 = 27,$$

$$m_5 = 450.$$

$$S = [1.3, 1.4, 1.6, 1.8] \text{ м.}$$

Задача L-24.19.

1



$$R_3 = 5, r_3 = 2, \rho_3 = 4,$$

$$R_4 = 3, r_4 = 1, \rho_4 = 2,$$

$$m_1 = 20, m_2 = 10,$$

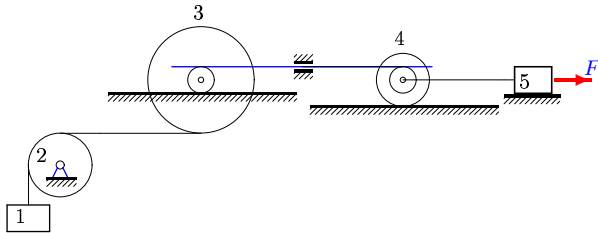
$$m_3 = 36, m_4 = 27,$$

$$m_5 = 36.$$

$$S = [10.3, 10.4, 10.6, 10.8] \text{ м.}$$

Задача L-24.20.

1



$$R_3 = 4, r_3 = 1, \rho_3 = 3,$$

$$R_4 = 2, r_4 = 1, \rho_4 = 1,$$

$$m_1 = 15, m_2 = 12,$$

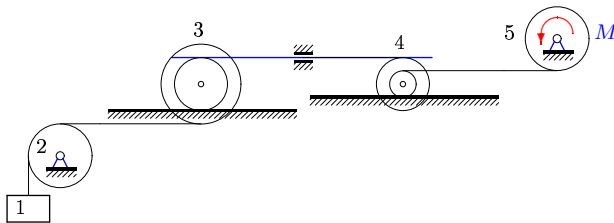
$$m_3 = 36, m_4 = 243,$$

$$m_5 = 162.$$

$$S = [4.3, 4.5, 4.6, 4.9] \text{ м.}$$

Задача L-24.21.

1



$$R_3 = 3, r_3 = 2, \rho_3 = 2,$$

$$R_4 = 2, r_4 = 1, \rho_4 = 1,$$

$$m_1 = 17, m_2 = 12,$$

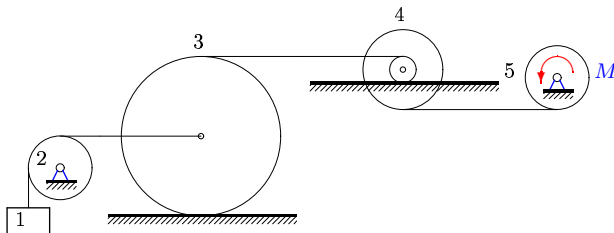
$$m_3 = 4, m_4 = 27,$$

$$m_5 = 36.$$

$$S = [6.3, 6.4, 6.6, 6.9] \text{ м.}$$

Задача L-24.22.

1



$$R_3 = 6,$$

$$R_4 = 3, r_4 = 1, \rho_4 = 2,$$

$$m_1 = 15, m_2 = 4,$$

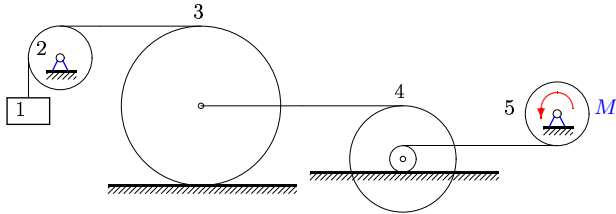
$$m_3 = 10, m_4 = 4,$$

$$m_5 = 6.$$

$$S = [10.2, 10.5, 10.6, 10.8] \text{ м.}$$

Задача L-24.23.

1



$$R_3 = 6,$$

$$R_4 = 4, r_4 = 1, \rho_4 = 3,$$

$$m_1 = 11, m_2 = 8,$$

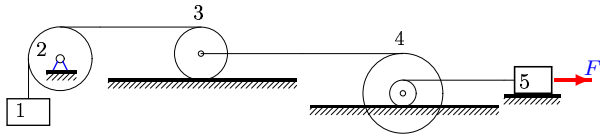
$$m_3 = 40, m_4 = 40,$$

$$m_5 = 150.$$

$$S = [6.2, 6.5, 6.6, 6.8] \text{ м.}$$

Задача L-24.24.

1



$$R_3 = 2,$$

$$R_4 = 3, r_4 = 1, \rho_4 = 2,$$

$$m_1 = 10, m_2 = 4,$$

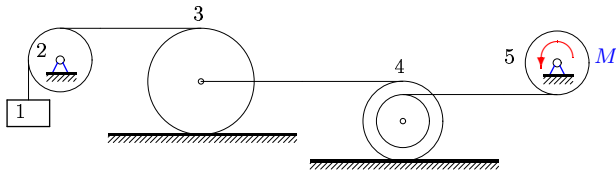
$$m_3 = 32, m_4 = 192,$$

$$m_5 = 32.$$

$$S = [6.3, 6.4, 6.7, 6.9] \text{ м.}$$

Задача L-24.25.

1



$$R_3 = 4,$$

$$R_4 = 3, r_4 = 2, \rho_4 = 2,$$

$$m_1 = 5, m_2 = 2,$$

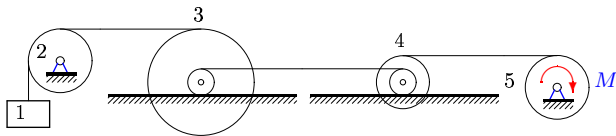
$$m_3 = 32, m_4 = 144,$$

$$m_5 = 288.$$

$$S = [1.2, 1.5, 1.6, 1.9] \text{ м.}$$

Задача L-24.26.

1



$$R_3 = 4, r_3 = 1, \rho_3 = 3,$$

$$R_4 = 2, r_4 = 1, \rho_4 = 1,$$

$$m_1 = 13, m_2 = 12,$$

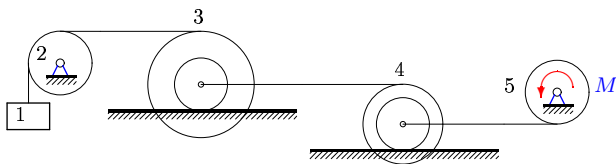
$$m_3 = 20, m_4 = 75,$$

$$m_5 = 100.$$

$$S = [6.2, 6.4, 6.6, 6.9] \text{ м.}$$

Задача L-24.27.

1



$$R_3 = 4, r_3 = 2, \rho_3 = 3,$$

$$R_4 = 3, r_4 = 2, \rho_4 = 2,$$

$$m_1 = 15, m_2 = 12,$$

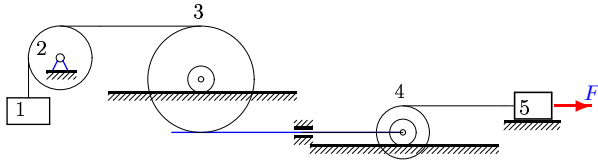
$$m_3 = 144, m_4 = 225,$$

$$m_5 = 450.$$

$$S = [7.2, 7.5, 7.6, 7.9] \text{ м.}$$

Задача L-24.28.

1



$$R_3 = 4, r_3 = 1, \rho_3 = 3,$$

$$R_4 = 2, r_4 = 1, \rho_4 = 1,$$

$$m_1 = 16, m_2 = 12,$$

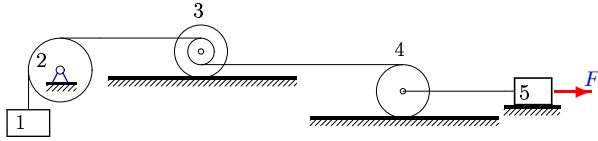
$$m_3 = 20, m_4 = 75,$$

$$m_5 = 50.$$

$$S = [7.3, 7.5, 7.6, 7.9] \text{ м.}$$

Задача L-24.29.

1



$$R_3 = 2, r_3 = 1, \rho_3 = 1,$$

$$R_4 = 2,$$

$$m_1 = 9, m_2 = 2,$$

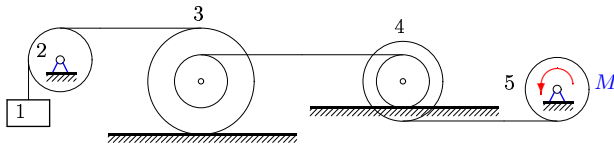
$$m_3 = 36, m_4 = 72,$$

$$m_5 = 72.$$

$$S = [3.3, 3.4, 3.7, 3.9] \text{ м.}$$

Задача L-24.30.

1



$$R_3 = 4, r_3 = 2, \rho_3 = 3,$$

$$R_4 = 3, r_4 = 2, \rho_4 = 2,$$

$$m_1 = 12, m_2 = 2,$$

$$m_3 = 256, m_4 = 96,$$

$$m_5 = 512.$$

$$S = [10.2, 10.4, 10.7, 10.9] \text{ м.}$$

Ответы.**Теорема об изменении кинетической энергии**

22-Jan-16

№	μ_1	μ_2	μ_3	μ_4	μ_5	$\sum \mu_k$	$M(v)$
1	21	3	20	135	81	260	4.092
2	11	5	104	225	9	354	1.248
3	14	2	205	180	144	545	1.952
4	13	2	30	100	256	401	2.335
5	11	6	8	27	9	61	2.984
6	15	2	8	135	18	178	3.301
7	20	5	60	125	100	310	3.658
8	23	6	40	7	6	82	7.623
9	18	5	52	351	72	498	2.733
10	12	3	12	15	4	46	4.274
11	11	1	100	128	128	368	2.370
12	19	2	12	25	16	74	6.943
13	11	5	164	117	9	306	1.991
14	7	3	41	294	784	1129	0.557
15	13	4	65	41	9	132	2.223
16	13	6	52	13	2	86	3.701
17	9	5	100	81	18	213	1.727
18	7	3	164	147	3136	3457	0.246
19	20	5	80	15	8	128	5.681
20	15	6	40	60	32	153	2.971
21	17	6	32	96	128	279	2.798
22	15	2	15	20	12	64	6.968
23	11	4	15	4	3	37	6.185
24	10	2	12	15	2	41	5.611
25	5	1	12	13	25	56	1.661
26	13	6	8	6	18	51	5.718
27	15	6	52	8	4	85	5.123
28	16	6	8	54	162	246	3.112
29	9	1	20	3	2	35	4.248
30	12	1	100	27	9	149	4.087

L-24 файл о24L1A