

Декартовы координаты. Пространственная траектория

Точка движется по закону $x = x(t), y = y(t), z = z(t)$. Определить скорость, ускорение точки и радиус кривизны траектории при $t = t_1$ (x, y и z даны в сантиметрах, t и t_1 — в секундах).

Кирсанов М.Н. **Решебник. Теоретическая механика**/Под ред. А. И. Кириллова. — М.: ФИЗМАТЛИТ, 2008. — 384 с. (с.137.)

Задача К2.1.

6

$$\begin{aligned}x &= \frac{1}{2} \sin 4t + 8t, \\y &= 9(t+1)^{1/10}, \\z &= \frac{11}{t+2}, \quad t_1 = 0.7.\end{aligned}$$

Задача К2.2.

6

$$\begin{aligned}x &= \frac{1}{2} \sin^2 4t - 5t, \\y &= 6(t+1)^{1/10}, \\z &= \frac{8}{t+2}, \quad t_1 = 0.4.\end{aligned}$$

Задача К2.3.

6

$$\begin{aligned}x &= 3t + \frac{1}{4} \cos^2 8t, \\y &= 2\sqrt{4t+2}, \\z &= 3t + \frac{1}{4} \cos^2 8t, \quad t_1 = 0.1.\end{aligned}$$

Задача К2.4.

6

$$\begin{aligned}x &= 12e^{t/4}, \\y &= \ln(2t+2), \\z &= \frac{1}{2} \sin^2 8t - 2t, \quad t_1 = 0.1.\end{aligned}$$

Задача К2.5.

6

$$\begin{aligned}x &= 6e^{(t^2)}, \\y &= 16e^{t/2}, \\z &= \frac{1}{2} \sin 4t + 6t, \quad t_1 = 0.5.\end{aligned}$$

Задача К2.6.

6

$$\begin{aligned}x &= 4(t+1)^{3/10}, \\y &= 4\arcsin(t/3), \\z &= 13e^{t/4}, \quad t_1 = 0.2.\end{aligned}$$

Задача К2.7.

6

$$\begin{aligned}x &= \frac{1}{2} \sin 6t + 11t, \\y &= \frac{1}{2} \sin^2 6t - 11t, \\z &= 12t + \frac{1}{2} \cos^2 6t, \quad t_1 = 1.\end{aligned}$$

Задача К2.8.

6

$$\begin{aligned}x &= 6t + \cos^2 4t, \\y &= 3t^2 + 5t + 2, \\z &= 4 \ln(2t+2), \quad t_1 = 0.4.\end{aligned}$$

Задача К2.9.

6

$$\begin{aligned}x &= 3t^2 + 10t + 2, \\y &= \frac{1}{2} \sin^2 8t - 10t, \\z &= 3t^2 + 10t + 2, \quad t_1 = 0.9.\end{aligned}$$

Задача К2.10.

6

$$\begin{aligned}x &= 12t + \cos^2 4t, \\y &= 10 \ln(2t+2), \\z &= 4\arcsin(t/11), \quad t_1 = 1.\end{aligned}$$

Задача K2.11.

6

$$\begin{aligned}x &= 3t^2 + 11t + 2, \\y &= 12(t + 1)^{3/10}, \\z &= 11\sqrt{2t + 11}, \quad t_1 = 1.\end{aligned}$$

Задача K2.12.

6

$$\begin{aligned}x &= \frac{13}{3t + 4}, \\y &= \frac{1}{2} \sin 8t + 10t, \\z &= 4\arcsin(t/10), \quad t_1 = 0.9.\end{aligned}$$

Задача K2.13.

6

$$\begin{aligned}x &= 9(t + 1)^{1/5}, \\y &= 18e^{t/3}, \\z &= 7 \ln(3t + 2), \quad t_1 = 0.7.\end{aligned}$$

Задача K2.14.

6

$$\begin{aligned}x &= 10e^{(t^2)}, \\y &= 9 \ln(2t + 2), \\z &= 20e^{t/4}, \quad t_1 = 0.9.\end{aligned}$$

Задача K2.15.

6

$$\begin{aligned}x &= \frac{1}{2} \sin 6t + 5t, \\y &= 5e^{(t^2)}, \\z &= 3\arcsin(t/5), \quad t_1 = 0.4.\end{aligned}$$

Задача K2.16.

6

$$\begin{aligned}x &= 3\operatorname{tg}(t/2), \\y &= 3 \ln(4t + 2), \\z &= 4e^{(t^2)}, \quad t_1 = 0.3.\end{aligned}$$

Задача K2.17.

6

$$\begin{aligned}x &= t^2 + 3t + 4, \\y &= \frac{1}{2} \sin 4t + 3t, \\z &= 3\operatorname{tg}(t/2), \quad t_1 = 0.2.\end{aligned}$$

Задача K2.18.

6

$$\begin{aligned}x &= \frac{13}{2t + 3}, \\y &= 9 \ln(3t + 2), \\z &= 11t + \frac{1}{2} \cos^2 6t, \quad t_1 = 0.9.\end{aligned}$$

Задача K2.19.

6

$$\begin{aligned}x &= \frac{1}{2} \sin 4t + 6t, \\y &= 2\arcsin(t/6), \\z &= 16e^{t/2}, \quad t_1 = 0.5.\end{aligned}$$

Задача K2.20.

6

$$\begin{aligned}x &= 6 \ln(2t + 2), \\y &= 3t^2 + 7t + 2, \\z &= 7e^{(t^2)}, \quad t_1 = 0.6.\end{aligned}$$

Задача K2.21.

6

$$\begin{aligned}x &= 5t + \cos^2 4t, \\y &= 5\operatorname{tg}(t/4), \\z &= 4\arcsin(t/4), \quad t_1 = 0.3.\end{aligned}$$

Задача K2.22.

6

$$\begin{aligned}x &= \frac{5}{3t + 4}, \\y &= 4\arcsin(t/2), \\z &= \ln(2t + 2), \quad t_1 = 0.1.\end{aligned}$$

Задача K2.23.

6

$$\begin{aligned}x &= 4 \ln(3t + 2), \\y &= 2t^2 + 5t + 3, \\z &= \frac{8}{2t + 3}, \quad t_1 = 0.4.\end{aligned}$$

Задача K2.25.

6

$$\begin{aligned}x &= 2t^2 + 2t + 3, \\y &= \frac{5}{2t + 3}, \\z &= 2e^{(t^2)}, \quad t_1 = 0.1.\end{aligned}$$

Задача K2.27.

6

$$\begin{aligned}x &= \frac{1}{2} \sin 6t + 11t, \\y &= 3 \arcsin(t/11), \\z &= 4 \operatorname{tg}(t/3), \quad t_1 = 1.\end{aligned}$$

Задача K2.29.

6

$$\begin{aligned}x &= 5 \operatorname{tg}(t/4), \\y &= 9t + \cos^2 4t, \\z &= 3t^2 + 8t + 2, \quad t_1 = 0.7.\end{aligned}$$

Задача K2.31.

6

$$\begin{aligned}x &= 5e^{(t^2)}, \\y &= 2t^2 + 5t + 3, \\z &= 4 \operatorname{tg}(t/3), \quad t_1 = 0.4.\end{aligned}$$

Задача K2.33.

6

$$\begin{aligned}x &= 6\sqrt{3t + 6}, \\y &= \frac{9}{2t + 3}, \\z &= \frac{1}{2} \sin 6t + 6t, \quad t_1 = 0.5.\end{aligned}$$

Задача K2.24.

6

$$\begin{aligned}x &= 2t^2 + 9t + 3, \\y &= \frac{12}{2t + 3}, \\z &= 10t + \frac{1}{2} \cos^2 6t, \quad t_1 = 0.8.\end{aligned}$$

Задача K2.26.

6

$$\begin{aligned}x &= 5 \operatorname{tg}(t/4), \\y &= 4 \arcsin(t/10), \\z &= 11t + \cos^2 4t, \quad t_1 = 0.9.\end{aligned}$$

Задача K2.28.

6

$$\begin{aligned}x &= 16e^{t/4}, \\y &= 4 \arcsin(t/6), \\z &= 5 \operatorname{tg}(t/4), \quad t_1 = 0.5.\end{aligned}$$

Задача K2.30.

6

$$\begin{aligned}x &= 10t + \frac{1}{2} \cos^2 6t, \\y &= 8 \ln(3t + 2), \\z &= 19e^{t/3}, \quad t_1 = 0.8.\end{aligned}$$

Задача K2.32.

6

$$\begin{aligned}x &= 9e^{(t^2)}, \\y &= 10(t + 1)^{3/10}, \\z &= 9\sqrt{2t + 9}, \quad t_1 = 0.8.\end{aligned}$$

Задача K2.34.

6

$$\begin{aligned}x &= 2t^2 + 9t + 3, \\y &= \frac{12}{2t + 3}, \\z &= 3 \arcsin(t/9), \quad t_1 = 0.8.\end{aligned}$$

К2 Ответы.**Декартовы координаты. Пространственная траектория** 07.04.2012

№	v_x	v_y	v_z	v	a_x	a_y	a_z	a	a_τ	a_n	R
1	6.12	0.56	-1.51	6.32	-2.68	-0.30	1.12	2.92	-2.88	0.45	89.842
2	-5.12	0.44	-1.39	5.32	-15.97	-0.28	1.16	16.02	15.04	5.52	5.127
3	1.00	2.58	1.00	2.94	0.93	-2.15	0.93	2.53	-1.25	2.19	3.953
4	3.08	0.91	2.00	3.78	0.77	-0.83	-1.87	2.18	-0.56	2.11	6.768
5	7.70	10.27	5.17	13.84	23.11	5.14	-7.27	24.77	13.96	20.46	9.364
6	1.06	1.34	3.42	3.82	-0.62	0.03	0.85	1.05	0.60	0.86	16.888
7	13.88	-12.61	13.61	23.17	5.03	30.38	-30.38	43.26	-31.36	29.79	18.023
8	6.23	7.40	2.86	10.09	31.95	6.00	-2.04	32.57	23.56	22.48	4.527
9	15.40	-6.14	15.40	22.63	6.00	-16.63	6.00	18.67	12.68	13.70	37.362
10	8.04	5.00	0.37	9.48	4.66	-2.50	0.00	5.28	2.63	4.58	19.600
11	17.00	2.22	3.05	17.41	6.00	-0.78	-0.23	6.05	5.72	1.99	152.309
12	-0.87	12.43	0.40	12.47	0.78	-25.40	0.00	25.41	-25.38	1.29	120.583
13	1.18	7.58	5.12	9.22	-0.55	2.53	-3.75	4.55	-0.08	4.55	18.677
14	40.46	4.74	6.26	41.22	117.79	-2.49	1.57	117.83	115.58	22.88	74.258
15	2.79	4.69	0.60	5.49	-12.16	15.49	0.01	19.69	7.07	18.38	1.641
16	1.53	3.75	2.63	4.83	0.23	-4.69	10.33	11.35	2.05	11.16	2.089
17	3.40	4.39	1.52	5.76	2.00	-5.74	0.15	6.08	-3.16	5.19	6.383
18	-1.13	5.74	13.94	15.12	0.94	-3.67	7.00	7.95	4.99	6.20	36.902
19	5.17	0.33	10.27	11.50	-7.27	0.00	5.14	8.90	1.32	8.81	15.027
20	3.75	10.60	12.04	16.47	-2.34	6.00	34.51	35.11	28.55	20.43	13.282
21	2.30	1.26	1.00	2.80	23.60	0.05	0.02	23.60	19.36	13.49	0.583
22	-0.81	2.00	0.91	2.34	1.13	0.05	-0.83	1.40	-0.67	1.23	4.458
23	3.75	6.60	-1.11	7.67	-3.52	4.00	1.17	5.45	1.55	5.23	11.263
24	12.20	-1.13	10.52	16.15	4.00	0.99	35.45	35.69	26.05	24.39	10.693
25	2.40	-0.98	0.40	2.62	4.00	1.22	4.12	5.87	3.84	4.44	1.549
26	1.32	0.40	7.83	7.95	0.15	0.00	-19.47	19.47	-19.15	3.51	17.969
27	13.88	0.27	1.49	13.96	5.03	0.00	0.34	5.04	5.04	0.22	895.231
28	4.53	0.67	1.27	4.75	1.13	0.01	0.08	1.14	1.10	0.27	83.056
29	1.29	11.53	12.20	16.83	0.11	-24.82	6.00	25.53	-12.64	22.19	12.770
30	10.52	5.45	8.27	14.45	35.45	-3.72	2.76	35.75	25.98	24.55	8.507
31	4.69	6.60	1.36	8.21	15.49	4.00	0.12	16.00	12.09	10.48	6.435
32	27.31	1.99	2.76	27.52	77.83	-0.77	-0.26	77.84	77.15	10.30	73.543
33	3.29	-1.13	3.03	4.61	-0.66	1.13	-2.54	2.85	-2.41	1.53	13.926
34	12.20	-1.13	0.33	12.26	4.00	0.99	0.00	4.12	3.89	1.36	110.777

К2 файл о2к6А