

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.

7

$$\begin{aligned}x &= 7 \ln(4t + 2), \\y &= t^2 + 8t + 4, \\z &= 7 \ln(4t + 2), \quad t_1 = 0.7.\end{aligned}$$

Задача К2.2.

7

$$\begin{aligned}x &= 7e^{(t^2)}, \\y &= 6 \ln(3t + 2), \\z &= \frac{10}{2t + 3}, \quad t_1 = 0.6.\end{aligned}$$

Задача К2.3.

7

$$\begin{aligned}x &= \frac{1}{2} \sin 8t + 7t, \\y &= 6 \ln(2t + 2), \\z &= \frac{10}{3t + 4}, \quad t_1 = 0.6.\end{aligned}$$

Задача К2.4.

7

$$\begin{aligned}x &= 11(t + 1)^{1/5}, \\y &= 20e^{t/3}, \\z &= \frac{1}{2} \sin^2 6t - 10t, \quad t_1 = 0.9.\end{aligned}$$

Задача К2.5.

7

$$\begin{aligned}x &= 9 \ln(2t + 2), \\y &= \frac{13}{3t + 4}, \\z &= 10e^{(t^2)}, \quad t_1 = 0.9.\end{aligned}$$

Задача К2.6.

7

$$\begin{aligned}x &= 10 \ln(2t + 2), \\y &= 5 \operatorname{tg}(t/4), \\z &= 4 \arcsin(t/11), \quad t_1 = 1.\end{aligned}$$

Задача К2.7.

7

$$\begin{aligned}x &= \frac{7}{t + 2}, \\y &= \frac{1}{2} \sin 4t + 4t, \\z &= 4e^{(t^2)}, \quad t_1 = 0.3.\end{aligned}$$

Задача К2.8.

7

$$\begin{aligned}x &= 4 \operatorname{tg}(t/3), \\y &= 3 \arcsin(t/3), \\z &= 4(t + 1)^{1/5}, \quad t_1 = 0.2.\end{aligned}$$

Задача К2.9.

7

$$\begin{aligned}x &= 3t^2 + 11t + 2, \\y &= 10 \ln(2t + 2), \\z &= 5 \operatorname{tg}(t/4), \quad t_1 = 1.\end{aligned}$$

Задача К2.10.

7

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

Задача K2.11.

7

$$x = \frac{7}{3t + 4},$$

$$y = 3t^2 + 4t + 2,$$

$$z = \frac{1}{2} \sin^2 8t - 4t, \quad t_1 = 0.3.$$

Задача K2.12.

7

$$x = \frac{8}{3t + 4},$$

$$y = 6(t + 1)^{3/10},$$

$$z = \frac{8}{3t + 4}, \quad t_1 = 0.4.$$

Задача K2.13.

7

$$x = 3\arcsin(t/4),$$

$$y = 3 \ln(3t + 2),$$

$$z = \frac{1}{2} \sin^2 6t - 4t, \quad t_1 = 0.3.$$

Задача K2.14.

7

$$x = \frac{1}{2} \sin^2 6t - 3t,$$

$$y = 4\operatorname{tg}(t/3),$$

$$z = 13e^{t/3}, \quad t_1 = 0.2.$$

Задача K2.15.

7

$$x = 12t + \frac{1}{2} \cos^2 6t,$$

$$y = 12(t + 1)^{1/5},$$

$$z = \frac{1}{2} \sin 6t + 11t, \quad t_1 = 1.$$

Задача K2.16.

7

$$x = 7\sqrt{2t + 7},$$

$$y = 8(t + 1)^{3/10},$$

$$z = 4\arcsin(t/7), \quad t_1 = 0.6.$$

Задача K2.17.

7

$$x = 4\operatorname{tg}(t/3),$$

$$y = 5(t + 1)^{1/5},$$

$$z = 2t^2 + 4t + 3, \quad t_1 = 0.3.$$

Задача K2.18.

7

$$x = 3\arcsin(t/6),$$

$$y = 7t + \frac{1}{2} \cos^2 6t,$$

$$z = 5 \ln(3t + 2), \quad t_1 = 0.5.$$

Задача K2.19.

7

$$x = \frac{1}{2} \sin 6t + 2t,$$

$$y = 2t^2 + 2t + 3,$$

$$z = 2\sqrt{3t + 2}, \quad t_1 = 0.1.$$

Задача K2.20.

7

$$x = 5\operatorname{tg}(t/4),$$

$$y = 4\arcsin(t/3),$$

$$z = 3\sqrt{2t + 3}, \quad t_1 = 0.2.$$

Задача K2.21.

7

$$x = 3\arcsin(t/7),$$

$$y = 6 \ln(3t + 2),$$

$$z = \frac{10}{2t + 3}, \quad t_1 = 0.6.$$

Задача K2.22.

7

$$x = 5\operatorname{tg}(t/4),$$

$$y = 12e^{t/4},$$

$$z = 4\arcsin(t/2), \quad t_1 = 0.1.$$

Задача K2.23.

7

$$\begin{aligned}x &= 2t^2 + 7t + 3, \\y &= 6 \ln(3t + 2), \\z &= \frac{10}{2t + 3}, \quad t_1 = 0.6.\end{aligned}$$

Задача K2.24.

7

$$\begin{aligned}x &= 2 \arcsin(t/7), \\y &= 7e^{(t^2)}, \\z &= 8t + \frac{1}{4} \cos^2 8t, \quad t_1 = 0.6.\end{aligned}$$

Задача K2.25.

7

$$\begin{aligned}x &= 3 \operatorname{tg}(t/2), \\y &= 10(t + 1)^{1/10}, \\z &= \frac{1}{2} \sin 4t + 9t, \quad t_1 = 0.8.\end{aligned}$$

Задача K2.26.

7

$$\begin{aligned}x &= \frac{1}{2} \sin^2 6t - 7t, \\y &= 6 \ln(3t + 2), \\z &= 7\sqrt{3t + 7}, \quad t_1 = 0.6.\end{aligned}$$

Задача K2.27.

7

$$\begin{aligned}x &= 9(t + 1)^{1/5}, \\y &= 8\sqrt{3t + 8}, \\z &= 8e^{(t^2)}, \quad t_1 = 0.7.\end{aligned}$$

Задача K2.28.

7

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

Задача K2.29.

7

$$\begin{aligned}x &= 13e^{t/2}, \\y &= 2 \ln(4t + 2), \\z &= \frac{1}{2} \sin 4t + 3t, \quad t_1 = 0.2.\end{aligned}$$

Задача K2.30.

7

$$\begin{aligned}x &= 14e^{t/4}, \\y &= 4\sqrt{2t + 4}, \\z &= \frac{7}{3t + 4}, \quad t_1 = 0.3.\end{aligned}$$

Задача K2.31.

7

$$\begin{aligned}x &= 15e^{t/3}, \\y &= 4 \operatorname{tg}(t/3), \\z &= 5e^{(t^2)}, \quad t_1 = 0.4.\end{aligned}$$

Задача K2.32.

7

$$\begin{aligned}x &= 11t + \frac{1}{4} \cos^2 8t, \\y &= \frac{1}{2} \sin^2 4t - 10t, \\z &= t^2 + 10t + 4, \quad t_1 = 0.9.\end{aligned}$$

Задача K2.33.

7

$$\begin{aligned}x &= 5e^{(t^2)}, \\y &= \frac{8}{3t + 4}, \\z &= 15e^{t/4}, \quad t_1 = 0.4.\end{aligned}$$

Задача K2.34.

7

$$\begin{aligned}x &= 13e^{t/3}, \\y &= 2t^2 + 3t + 3, \\z &= 4(t + 1)^{1/5}, \quad t_1 = 0.2.\end{aligned}$$

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	5.83	9.40	5.83	12.51	-4.86	2.00	-4.86	7.16	-3.03	6.49	24.115
2	12.04	4.74	-1.13	12.99	34.51	-3.74	1.08	34.73	30.54	16.55	10.193
3	7.35	3.75	-0.89	8.30	31.88	-2.34	0.92	31.98	27.07	17.02	4.048
4	1.32	9.00	-12.94	15.82	-0.55	3.00	-7.00	7.63	7.38	1.93	129.753
5	4.74	-0.87	40.46	40.75	-2.49	0.78	117.79	117.82	116.66	16.50	100.638
6	5.00	1.33	0.37	5.19	-2.50	0.17	0.00	2.51	-2.37	0.83	32.602
7	-1.32	4.72	2.63	5.57	1.15	-7.46	10.33	12.79	-1.73	12.67	2.444
8	1.34	1.00	0.69	1.81	0.06	0.02	-0.46	0.47	-0.12	0.45	7.285
9	17.00	5.00	1.33	17.77	6.00	-2.50	0.17	6.50	5.05	4.10	77.079
10	5.80	0.44	4.69	7.47	2.00	-0.28	15.49	15.62	11.26	10.82	5.161
11	-0.87	5.80	-7.98	9.91	1.07	6.00	5.60	8.28	-1.10	8.20	11.965
12	-0.89	1.42	-0.89	1.90	1.02	-0.71	1.02	1.61	-1.49	0.62	5.848
13	0.75	3.10	-5.33	6.21	0.01	-3.21	-32.28	32.44	26.09	19.29	2.000
14	-0.97	1.34	4.63	4.92	-26.55	0.06	1.54	26.59	6.72	25.73	0.941
15	13.61	1.38	13.88	19.49	-30.38	-0.55	5.03	30.80	-17.67	25.22	15.058
16	2.44	1.73	0.57	3.05	-0.30	-0.76	0.01	0.81	-0.67	0.47	19.970
17	1.35	0.81	5.20	5.43	0.09	-0.50	4.00	4.03	3.78	1.41	20.904
18	0.50	7.84	4.29	8.95	0.01	-34.57	-3.67	34.76	-32.04	13.48	5.938
19	4.48	2.40	1.98	5.45	-10.16	4.00	-1.29	11.00	-7.05	8.44	3.520
20	1.25	1.34	1.63	2.45	0.03	0.03	-0.48	0.48	-0.29	0.39	15.532
21	0.43	4.74	-1.13	4.89	0.01	-3.74	1.08	3.89	-3.87	0.39	61.139
22	1.25	3.08	2.00	3.88	0.02	0.77	0.05	0.77	0.64	0.43	35.123
23	9.40	4.74	-1.13	10.59	4.00	-3.74	1.08	5.58	1.76	5.30	21.165
24	0.29	12.04	8.35	14.65	0.00	34.51	31.51	46.73	46.31	6.29	34.131
25	1.77	0.59	7.00	7.25	0.75	-0.29	0.47	0.93	0.61	0.70	74.882
26	-4.62	4.74	3.54	7.50	21.90	-3.74	-0.60	22.23	-16.13	15.29	3.681
27	1.18	3.78	18.28	18.70	-0.55	-0.56	51.71	51.72	50.39	11.62	30.097
28	1.27	0.67	1.27	1.92	0.08	0.01	0.08	0.11	0.11	0.03	119.927
29	7.18	2.86	4.39	8.89	3.59	-4.08	-5.74	7.91	-1.25	7.81	10.128
30	3.77	1.87	-0.87	4.30	0.94	-0.41	1.07	1.48	0.43	1.42	13.023
31	5.71	1.36	4.69	7.52	1.90	0.12	15.49	15.61	11.14	10.93	5.171
32	9.07	-8.41	11.80	17.10	8.31	9.73	2.00	12.96	1.00	12.92	22.624
33	4.69	-0.89	4.14	6.32	15.49	1.02	1.04	15.56	12.03	9.86	4.055
34	4.63	3.80	0.69	6.03	1.54	4.00	-0.46	4.31	3.65	2.29	15.875

К2 файл о2к7А