

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

Задача К2.1.

1

$$x = \frac{10}{3t + 4},$$
$$y = 6 \ln(2t + 2),$$
$$z = 4 \arcsin(t/7), \quad t_1 = 0.6.$$

Задача К2.2.

1

$$x = 4 \operatorname{tg}(t/3),$$
$$y = 3 \arcsin(t/9),$$
$$z = 2t^2 + 9t + 3, \quad t_1 = 0.8.$$

Задача К2.3.

1

$$x = 2t^2 + 2t + 3,$$
$$y = \frac{5}{2t + 3},$$
$$z = \frac{1}{2} \sin^2 6t - 2t, \quad t_1 = 0.1.$$

Задача К2.4.

1

$$x = \frac{1}{2} \sin^2 8t - 7t,$$
$$y = 3t^2 + 7t + 2,$$
$$z = 8t + \cos^2 4t, \quad t_1 = 0.6.$$

Задача К2.5.

1

$$x = \frac{14}{t + 2},$$
$$y = 10 \ln(4t + 2),$$
$$z = 12(t + 1)^{1/10}, \quad t_1 = 1.$$

Задача К2.6.

1

$$x = 8t + \cos^2 4t,$$
$$y = 4 \arcsin(t/7),$$
$$z = 5 \operatorname{tg}(t/4), \quad t_1 = 0.6.$$

Задача К2.7.

1

$$x = 7(t + 1)^{1/5},$$
$$y = 6e^{(t^2)},$$
$$z = 16e^{t/3}, \quad t_1 = 0.5.$$

Задача К2.8.

1

$$x = 8t + \frac{1}{2} \cos^2 6t,$$
$$y = \frac{1}{2} \sin^2 6t - 7t,$$
$$z = 7\sqrt{3t + 7}, \quad t_1 = 0.6.$$

Задача К2.9.

1

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

Задача К2.10.

1

$$x = 3 \operatorname{tg}(t/2),$$
$$y = 2 \arcsin(t/9),$$
$$z = 9e^{(t^2)}, \quad t_1 = 0.8.$$

Задача K2.11.

I

$$\begin{aligned}x &= 3\arcsin(t/3), \\y &= 2\ln(3t+2), \\z &= 3\sqrt{3t+3}, \quad t_1 = 0.2.\end{aligned}$$

Задача K2.12.

I

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

Задача K2.13.

I

$$\begin{aligned}x &= 12e^{t/3}, \\y &= 3(t+1)^{1/5}, \\z &= 2\sqrt{3t+2}, \quad t_1 = 0.1.\end{aligned}$$

Задача K2.14.

I

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

Задача K2.15.

I

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

Задача K2.16.

I

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

Задача K2.17.

I

$$\begin{aligned}x &= 4e^{(t^2)}, \\y &= 5(t+1)^{1/5}, \\z &= 3\ln(3t+2), \quad t_1 = 0.3.\end{aligned}$$

Задача K2.18.

I

$$\begin{aligned}x &= \ln(3t+2), \\y &= 3(t+1)^{1/5}, \\z &= 2t^2 + 2t + 3, \quad t_1 = 0.1.\end{aligned}$$

Задача K2.19.

I

$$\begin{aligned}x &= \frac{1}{2}\sin^2 4t - 11t, \\y &= 11\sqrt{4t+11}, \\z &= 12t + \frac{1}{4}\cos^2 8t, \quad t_1 = 1.\end{aligned}$$

Задача K2.20.

I

$$\begin{aligned}x &= 4\arcsin(t/10), \\y &= 10e^{(t^2)}, \\z &= 11(t+1)^{3/10}, \quad t_1 = 0.9.\end{aligned}$$

Задача K2.21.

I

$$\begin{aligned}x &= \frac{1}{2}\sin^2 6t - 11t, \\y &= \frac{14}{2t+3}, \\z &= 11e^{(t^2)}, \quad t_1 = 1.\end{aligned}$$

Задача K2.22.

I

$$\begin{aligned}x &= 5\ln(2t+2), \\y &= 3t^2 + 6t + 2, \\z &= 6\sqrt{2t+6}, \quad t_1 = 0.5.\end{aligned}$$

Задача K2.23.

1

$$\begin{aligned}x &= 9 \ln(3t + 2), \\y &= 20e^{t/3}, \\z &= 2t^2 + 10t + 3, \quad t_1 = 0.9.\end{aligned}$$

Задача K2.24.

1

$$\begin{aligned}x &= 16e^{t/3}, \\y &= 3\arcsin(t/6), \\z &= 5 \ln(3t + 2), \quad t_1 = 0.5.\end{aligned}$$

Задача K2.25.

1

$$\begin{aligned}x &= 4\arcsin(t/11), \\y &= 12t + \cos^2 4t, \\z &= 21e^{t/4}, \quad t_1 = 1.\end{aligned}$$

Задача K2.26.

1

$$\begin{aligned}x &= 2\sqrt{2t + 2}, \\y &= 5\operatorname{tg}(t/4), \\z &= \frac{1}{2} \sin^2 8t - 2t, \quad t_1 = 0.1.\end{aligned}$$

Задача K2.27.

1

$$\begin{aligned}x &= 8e^{(t^2)}, \\y &= 9t + \frac{1}{2} \cos^2 6t, \\z &= \frac{1}{2} \sin 6t + 8t, \quad t_1 = 0.7.\end{aligned}$$

Задача K2.28.

1

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

Задача K2.29.

1

$$\begin{aligned}x &= \frac{12}{t + 2}, \\y &= 2\arcsin(t/9), \\z &= 10(t + 1)^{1/10}, \quad t_1 = 0.8.\end{aligned}$$

Задача K2.30.

1

$$\begin{aligned}x &= 6e^{(t^2)}, \\y &= 2t^2 + 6t + 3, \\z &= \frac{9}{2t + 3}, \quad t_1 = 0.5.\end{aligned}$$

Задача K2.31.

1

$$\begin{aligned}x &= \frac{13}{2t + 3}, \\y &= 11(t + 1)^{1/5}, \\z &= \frac{13}{2t + 3}, \quad t_1 = 0.9.\end{aligned}$$

Задача K2.32.

1

$$\begin{aligned}x &= 5t + \frac{1}{2} \cos^2 6t, \\y &= \frac{1}{2} \sin^2 6t - 4t, \\z &= 4\operatorname{tg}(t/3), \quad t_1 = 0.3.\end{aligned}$$

Задача K2.33.

1

$$\begin{aligned}x &= 8(t + 1)^{1/10}, \\y &= 3\operatorname{tg}(t/2), \\z &= 8t + \frac{1}{4} \cos^2 8t, \quad t_1 = 0.6.\end{aligned}$$

Задача K2.34.

1

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

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	-0.89	3.75	0.57	3.90	0.92	-2.34	0.01	2.52	-2.47	0.52	29.441
2	1.43	0.33	12.20	12.29	0.26	0.00	4.00	4.01	4.00	0.23	648.675
3	2.40	-0.98	0.80	2.71	4.00	1.22	13.04	13.70	6.93	11.81	0.622
4	-7.70	10.60	11.98	17.76	-63.02	6.00	-2.80	63.37	29.01	56.33	5.596
5	-1.56	6.67	0.64	6.88	1.04	-4.44	-0.29	4.57	-4.57	0.14	340.814
6	11.98	0.57	1.28	12.07	-2.80	0.01	0.10	2.80	-2.77	0.42	349.219
7	1.01	7.70	6.30	10.00	-0.54	23.11	2.10	23.21	19.07	13.24	7.558
8	5.62	-4.62	3.54	8.09	-21.90	21.90	-0.60	30.98	-27.98	13.29	4.923
9	11.80	40.46	6.43	42.64	2.00	117.79	-4.59	117.90	111.65	37.87	47.997
10	1.77	0.22	27.31	27.37	0.75	0.00	77.83	77.84	77.71	4.33	173.016
11	1.00	2.31	2.37	3.46	0.02	-2.66	-0.99	2.84	-2.45	1.44	8.306
12	4.60	-2.65	-1.32	5.47	2.00	-11.80	1.15	12.02	7.12	9.69	3.089
13	4.14	0.56	1.98	4.62	1.38	-0.40	-1.29	1.93	0.63	1.82	11.691
14	2.79	3.01	0.92	4.21	-12.16	-0.73	-0.52	12.19	-8.70	8.54	2.070
15	1.34	3.80	1.00	4.15	0.06	4.00	0.02	4.00	3.69	1.56	11.080
16	-1.55	1.85	40.46	40.53	1.07	0.89	117.79	117.80	117.58	7.14	230.105
17	2.63	0.81	3.10	4.15	10.33	-0.50	-3.21	10.83	4.04	10.05	1.711
18	1.30	0.56	2.40	2.79	-1.70	-0.40	4.00	4.37	2.57	3.53	2.201
19	-9.02	5.68	12.58	16.49	-2.33	-0.76	30.65	30.74	24.39	18.72	14.522
20	0.40	40.46	2.11	40.52	0.00	117.79	-0.78	117.79	117.59	6.99	234.763
21	-12.61	-1.12	59.80	61.13	30.38	0.90	179.41	181.96	169.23	66.86	55.886
22	3.33	9.00	2.27	9.86	-2.22	6.00	-0.32	6.41	4.65	4.41	22.069
23	5.74	9.00	13.60	17.29	-3.67	3.00	4.00	6.20	3.49	5.13	58.327
24	6.30	0.50	4.29	7.64	2.10	0.01	-3.67	4.23	-0.33	4.22	13.823
25	0.37	8.04	6.74	10.50	0.00	4.66	1.69	4.95	4.65	1.71	64.603
26	1.35	1.25	2.00	2.72	-0.61	0.02	-1.87	1.97	-1.67	1.04	7.123
27	18.28	6.44	6.53	20.45	51.71	18.69	15.69	57.18	57.12	2.73	153.459
28	0.22	27.31	0.22	27.31	0.00	77.83	0.00	77.83	77.83	0.90	832.451
29	-1.53	0.22	0.59	1.66	1.09	0.00	-0.29	1.13	-1.12	0.19	14.129
30	7.70	8.00	-1.13	11.16	23.11	4.00	1.13	23.48	18.70	14.20	8.776
31	-1.13	1.32	-1.13	2.07	0.94	-0.55	0.94	1.44	-1.38	0.42	10.222
32	6.33	-5.33	1.35	8.38	32.28	-32.28	0.09	45.66	44.91	8.21	8.557
33	0.52	1.64	8.35	8.53	-0.29	0.51	31.51	31.52	30.94	6.01	12.102
34	2.37	3.80	0.69	4.53	-0.99	4.00	-0.46	4.15	2.77	3.09	6.652

К2 файл о2к1А