

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.

5

$$\begin{aligned}x &= \frac{7}{3t+4}, \\y &= \frac{1}{2} \sin 8t + 4t, \\z &= 4\sqrt{2t+4}, \quad t_1 = 0.3.\end{aligned}$$

Задача К2.2.

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$$\begin{aligned}x &= 7t + \cos^2 4t, \\y &= 5\operatorname{tg}(t/4), \\z &= 3t^2 + 6t + 2, \quad t_1 = 0.5.\end{aligned}$$

Задача К2.3.

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$$\begin{aligned}x &= \frac{14}{t+2}, \\y &= 10 \ln(4t+2), \\z &= \frac{1}{2} \sin^2 4t - 11t, \quad t_1 = 1.\end{aligned}$$

Задача К2.4.

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$$\begin{aligned}x &= 6e^{(t^2)}, \\y &= 3\operatorname{tg}(t/2), \\z &= \frac{1}{2} \sin^2 4t - 6t, \quad t_1 = 0.5.\end{aligned}$$

Задача К2.5.

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$$\begin{aligned}x &= \frac{1}{2} \sin 4t + 6t, \\y &= 6\sqrt{4t+6}, \\z &= \frac{9}{t+2}, \quad t_1 = 0.5.\end{aligned}$$

Задача К2.6.

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$$\begin{aligned}x &= \frac{11}{2t+3}, \\y &= 9t + \frac{1}{2} \cos^2 6t, \\z &= 8e^{(t^2)}, \quad t_1 = 0.7.\end{aligned}$$

Задача К2.7.

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

Задача К2.8.

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$$\begin{aligned}x &= \frac{5}{t+2}, \\y &= 12e^{t/2}, \\z &= t^2 + 2t + 4, \quad t_1 = 0.1.\end{aligned}$$

Задача К2.9.

5

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

Задача К2.10.

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$$\begin{aligned}x &= \frac{1}{2} \sin^2 4t - 9t, \\y &= 10t + \frac{1}{4} \cos^2 8t, \\z &= 8 \ln(4t+2), \quad t_1 = 0.8.\end{aligned}$$

Задача K2.11.

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

Задача K2.12.

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$$\begin{aligned}x &= 16e^{t/3}, \\y &= 5 \ln(3t+2), \\z &= \frac{1}{2} \sin 6t + 6t, \quad t_1 = 0.5.\end{aligned}$$

Задача K2.13.

5

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

Задача K2.14.

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

Задача K2.15.

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

Задача K2.16.

5

$$\begin{aligned}x &= \frac{7}{3t+4}, \\y &= 5t + \cos^2 4t, \\z &= 3 \ln(2t+2), \quad t_1 = 0.3.\end{aligned}$$

Задача K2.17.

5

$$\begin{aligned}x &= 5\operatorname{tg}(t/4), \\y &= 9(t+1)^{3/10}, \\z &= 18e^{t/4}, \quad t_1 = 0.7.\end{aligned}$$

Задача K2.18.

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$$\begin{aligned}x &= 2t^2 + 9t + 3, \\y &= 9\sqrt{3t+9}, \\z &= 8 \ln(3t+2), \quad t_1 = 0.8.\end{aligned}$$

Задача K2.19.

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$$\begin{aligned}x &= 6\sqrt{3t+6}, \\y &= 5 \ln(3t+2), \\z &= 7t + \frac{1}{2} \cos^2 6t, \quad t_1 = 0.5.\end{aligned}$$

Задача K2.20.

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

Задача K2.21.

5

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

Задача K2.22.

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$$\begin{aligned}x &= 6 \ln(2t+2), \\y &= 3t^2 + 7t + 2, \\z &= 5\operatorname{tg}(t/4), \quad t_1 = 0.6.\end{aligned}$$

Задача K2.23.

5

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

Задача K2.25.

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$$\begin{aligned}x &= 21e^{t/3}, \\y &= \frac{1}{2}\sin 6t + 11t, \\z &= 12t + \frac{1}{2}\cos^2 6t, \quad t_1 = 1.\end{aligned}$$

Задача K2.27.

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$$\begin{aligned}x &= 6t + \cos^2 4t, \\y &= 6(t+1)^{3/10}, \\z &= 5\sqrt{2t+5}, \quad t_1 = 0.4.\end{aligned}$$

Задача K2.29.

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

Задача K2.31.

5

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

Задача K2.33.

5

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

Задача K2.24.

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

Задача K2.26.

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$$\begin{aligned}x &= 3\arcsin(t/8), \\y &= 8\sqrt{3t+8}, \\z &= \frac{11}{2t+3}, \quad t_1 = 0.7.\end{aligned}$$

Задача K2.28.

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

Задача K2.30.

5

$$\begin{aligned}x &= 6e^{(t^2)}, \\y &= 7t + \frac{1}{4}\cos^2 8t, \\z &= 5\ln(4t+2), \quad t_1 = 0.5.\end{aligned}$$

Задача K2.32.

5

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

Задача K2.34.

5

$$\begin{aligned}x &= 9e^{(t^2)}, \\y &= 3t^2 + 9t + 2, \\z &= 19e^{t/4}, \quad t_1 = 0.8.\end{aligned}$$

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	-0.87	1.05	1.87	2.31	1.07	-21.61	-0.41	21.65	-10.55	18.90	0.283
2	10.03	1.27	9.00	13.53	20.92	0.08	6.00	21.76	19.49	9.67	18.946
3	-1.56	6.67	-9.02	11.32	1.04	-4.44	-2.33	5.12	-0.90	5.04	25.432
4	7.70	1.60	-7.51	10.88	23.11	0.41	-10.46	25.37	23.65	9.19	12.882
5	5.17	4.24	-1.44	6.84	-7.27	-1.06	1.15	7.44	-6.40	3.80	12.306
6	-1.14	6.44	18.28	19.42	1.03	18.69	51.71	55.00	54.83	4.27	88.184
7	10.60	0.59	27.31	29.30	2.00	-0.29	77.83	77.86	73.26	26.36	32.571
8	-1.13	6.31	2.20	6.78	1.08	3.15	2.00	3.89	3.40	1.88	24.466
9	3.01	8.99	0.92	9.52	-0.73	-3.15	-0.52	3.28	-3.25	0.38	241.702
10	-8.77	9.54	6.15	14.34	15.89	-31.13	-4.73	35.27	-32.45	13.83	14.872
11	0.27	59.80	4.41	59.97	0.00	179.41	-0.47	179.41	178.88	13.69	262.678
12	6.30	4.29	3.03	8.20	2.10	-3.67	-2.54	4.94	-1.24	4.78	14.081
13	15.00	-12.61	15.00	24.68	4.00	30.38	4.00	30.90	-10.66	29.00	20.997
14	5.42	11.80	0.20	12.99	-0.80	2.00	0.00	2.15	1.48	1.56	108.135
15	0.75	1.35	2.63	3.05	0.01	0.09	10.33	10.33	8.95	5.16	1.798
16	-0.87	2.30	2.31	3.37	1.07	23.60	-1.78	23.69	14.59	18.66	0.609
17	1.29	1.86	5.36	5.82	0.11	-0.77	1.34	1.55	1.01	1.17	28.953
18	12.20	4.00	5.45	13.95	4.00	-0.53	-3.72	5.49	1.89	5.15	37.782
19	3.29	4.29	7.84	9.52	-0.66	-3.67	-34.57	34.77	-30.34	16.97	5.339
20	1.73	11.98	-7.70	14.35	-0.76	-2.80	-63.02	63.09	31.38	54.73	3.761
21	18.28	-9.26	9.40	22.55	51.71	12.41	2.00	53.22	37.67	37.60	13.522
22	3.75	10.60	1.28	11.32	-2.34	6.00	0.10	6.44	4.85	4.24	30.237
23	1.25	1.63	0.00	2.05	0.03	-0.48	0.93	1.05	-0.36	0.99	4.273
24	1.34	2.31	4.63	5.35	0.06	-2.66	1.54	3.08	0.20	3.07	9.302
25	9.77	13.88	13.61	21.76	3.26	5.03	-30.38	30.96	-14.33	27.45	17.245
26	0.38	3.78	-1.14	3.96	0.00	-0.56	1.03	1.18	-0.83	0.83	18.863
27	6.23	1.42	2.08	6.72	31.95	-0.71	-0.36	31.96	29.36	12.61	3.583
28	5.62	4.31	1.39	7.22	-21.90	7.97	0.19	23.30	-12.26	19.82	2.627
29	3.84	2.20	1.00	4.54	-3.12	2.00	0.93	3.82	-1.46	3.53	5.841
30	7.70	5.02	5.00	10.47	23.11	4.66	-5.00	24.10	16.86	17.23	6.361
31	5.45	-1.48	1.64	5.89	-4.96	1.14	0.51	5.11	-4.74	1.92	18.060
32	8.00	0.50	4.29	9.09	4.00	0.01	-3.67	5.43	1.79	5.13	16.112
33	8.21	40.46	-1.55	41.32	3.54	117.79	1.07	117.85	116.02	20.66	82.602
34	27.31	13.80	5.80	31.14	77.83	6.00	1.45	78.08	71.18	32.08	30.230

К2 файл о2к5А