

## 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.

4

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

### Задача К2.2.

4

$$\begin{aligned}x &= \frac{1}{2} \sin 4t + 4t, \\y &= 5t + \frac{1}{4} \cos^2 8t, \\z &= 4\sqrt{4t+4}, \quad t_1 = 0.3.\end{aligned}$$

### Задача К2.3.

4

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

### Задача К2.4.

4

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

### Задача К2.5.

4

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

### Задача К2.6.

4

$$\begin{aligned}x &= 5\operatorname{tg}(t/4), \\y &= \frac{1}{2} \sin^2 8t - 6t, \\z &= 3t^2 + 6t + 2, \quad t_1 = 0.5.\end{aligned}$$

### Задача К2.7.

4

$$\begin{aligned}x &= 4e^{(t^2)}, \\y &= \frac{1}{2} \sin^2 4t - 4t, \\z &= 5t + \frac{1}{4} \cos^2 8t, \quad t_1 = 0.3.\end{aligned}$$

### Задача К2.8.

4

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

### Задача К2.9.

4

$$\begin{aligned}x &= 4\operatorname{tg}(t/3), \\y &= 8(t+1)^{1/5}, \\z &= \frac{1}{2} \sin 6t + 7t, \quad t_1 = 0.6.\end{aligned}$$

### Задача К2.10.

4

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

**Задача K2.11.**

4

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

**Задача K2.12.**

4

$$\begin{aligned}x &= 4\arcsin(t/11), \\y &= \frac{1}{2}\sin 8t + 11t, \\z &= 21e^{t/4}, \quad t_1 = 1.\end{aligned}$$

**Задача K2.13.**

4

$$\begin{aligned}x &= 10(t+1)^{1/5}, \\y &= \frac{1}{2}\sin 6t + 9t, \\z &= 4\operatorname{tg}(t/3), \quad t_1 = 0.8.\end{aligned}$$

**Задача K2.14.**

4

$$\begin{aligned}x &= 2\arcsin(t/8), \\y &= 8e^{(t^2)}, \\z &= 2\arcsin(t/8), \quad t_1 = 0.7.\end{aligned}$$

**Задача K2.15.**

4

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

**Задача K2.16.**

4

$$\begin{aligned}x &= 9(t+1)^{3/10}, \\y &= 5\operatorname{tg}(t/4), \\z &= 4\arcsin(t/8), \quad t_1 = 0.7.\end{aligned}$$

**Задача K2.17.**

4

$$\begin{aligned}x &= \frac{1}{2}\sin^2 6t - 3t, \\y &= 3\sqrt{3t+3}, \\z &= \frac{6}{2t+3}, \quad t_1 = 0.2.\end{aligned}$$

**Задача K2.18.**

4

$$\begin{aligned}x &= 2\arcsin(t/5), \\y &= 15e^{t/2}, \\z &= 6(t+1)^{1/10}, \quad t_1 = 0.4.\end{aligned}$$

**Задача K2.19.**

4

$$\begin{aligned}x &= 14e^{t/3}, \\y &= 4e^{(t^2)}, \\z &= 4\operatorname{tg}(t/3), \quad t_1 = 0.3.\end{aligned}$$

**Задача K2.20.**

4

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

**Задача K2.21.**

4

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

**Задача K2.22.**

4

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

**Задача K2.23.**

4

$$\begin{aligned}x &= \frac{1}{2} \sin 8t + 9t, \\y &= 5 \operatorname{tg}(t/4), \\z &= 19e^{t/4}, \quad t_1 = 0.8.\end{aligned}$$

**Задача K2.24.**

4

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

**Задача K2.25.**

4

$$\begin{aligned}x &= 6 \ln(2t + 2), \\y &= 17e^{t/4}, \\z &= 7e^{(t^2)}, \quad t_1 = 0.6.\end{aligned}$$

**Задача K2.26.**

4

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

**Задача K2.27.**

4

$$\begin{aligned}x &= 3 \arcsin(t/9), \\y &= \frac{1}{2} \sin^2 6t - 9t, \\z &= 9e^{(t^2)}, \quad t_1 = 0.8.\end{aligned}$$

**Задача K2.28.**

4

$$\begin{aligned}x &= 18e^{t/2}, \\y &= 8e^{(t^2)}, \\z &= t^2 + 8t + 4, \quad t_1 = 0.7.\end{aligned}$$

**Задача K2.29.**

4

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

**Задача K2.30.**

4

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

**Задача K2.31.**

4

$$\begin{aligned}x &= 11e^{(t^2)}, \\y &= 2 \arcsin(t/11), \\z &= \frac{1}{2} \sin^2 4t - 11t, \quad t_1 = 1.\end{aligned}$$

**Задача K2.32.**

4

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

**Задача K2.33.**

4

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

**Задача K2.34.**

4

$$\begin{aligned}x &= 2 \arcsin(t/6), \\y &= 16e^{t/2}, \\z &= 7(t + 1)^{1/10}, \quad t_1 = 0.5.\end{aligned}$$

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

№	$v_x$	$v_y$	$v_z$	$v$	$a_x$	$a_y$	$a_z$	$a$	$a_\tau$	$a_n$	$R$
1	0.75	2.63	0.81	2.85	0.01	10.33	-0.50	10.34	9.38	4.35	1.866
2	4.72	6.99	3.51	9.14	-7.46	-2.80	-1.35	8.08	-6.51	4.78	17.487
3	4.69	2.79	8.99	10.52	15.49	-12.16	-3.15	19.94	1.00	19.92	5.553
4	-4.62	5.62	9.40	11.89	21.90	-21.90	4.00	31.23	-15.70	27.00	5.233
5	10.60	0.57	3.75	11.26	6.00	0.01	-2.34	6.44	4.87	4.22	30.053
6	1.27	-2.04	9.00	9.32	0.08	-9.31	6.00	11.08	7.85	7.82	11.102
7	2.63	-2.65	6.99	7.93	10.33	-11.80	-2.80	15.93	4.90	15.16	4.144
8	11.80	5.42	-1.55	13.08	2.00	-0.80	1.07	2.40	1.35	1.99	85.995
9	1.39	1.10	4.31	4.66	0.19	-0.55	7.97	7.99	7.29	3.25	6.675
10	0.00	1.63	1.67	2.33	0.93	-0.48	-1.39	1.74	-1.33	1.13	4.816
11	3.89	4.69	0.44	6.11	-1.18	15.49	-0.28	15.54	11.12	10.85	3.445
12	0.37	10.42	6.74	12.41	0.00	-31.66	1.69	31.70	-25.65	18.63	8.272
13	1.25	9.26	1.43	9.46	-0.56	17.93	0.26	17.94	17.53	3.82	23.428
14	0.25	18.28	0.25	18.29	0.00	51.71	0.00	51.71	51.70	1.00	334.422
15	-2.04	3.33	0.67	3.97	-9.31	-2.22	0.01	9.57	2.93	9.11	1.726
16	1.86	1.29	0.50	2.32	-0.77	0.11	0.01	0.78	-0.55	0.55	9.869
17	-0.97	2.37	-1.04	2.77	-26.55	-0.99	1.22	26.59	8.04	25.35	0.302
18	0.40	9.16	0.44	9.18	0.01	4.58	-0.28	4.59	4.56	0.54	155.629
19	5.16	2.63	1.35	5.94	1.72	10.33	0.09	10.47	6.08	8.53	4.141
20	5.45	8.20	1.64	9.98	-4.96	2.00	0.51	5.37	-0.98	5.28	18.880
21	-0.87	2.63	5.80	6.43	1.07	10.33	6.00	11.99	9.49	7.33	5.632
22	7.00	-1.44	-7.51	10.37	2.00	1.15	-10.46	10.71	8.77	6.15	17.484
23	12.97	1.30	5.80	14.27	-3.73	0.13	1.45	4.00	-2.79	2.87	70.884
24	1.36	3.75	0.60	4.03	0.12	-3.52	0.01	3.52	-3.23	1.40	11.606
25	3.75	4.94	12.04	13.54	-2.34	1.23	34.51	34.62	30.49	16.40	11.185
26	3.75	3.51	2.63	5.77	-4.69	-1.35	10.33	11.42	0.83	11.39	2.920
27	0.33	-9.52	27.31	28.92	0.00	-35.45	77.83	85.52	85.16	7.91	105.815
28	12.77	18.28	9.40	24.20	6.39	51.71	2.00	52.14	43.21	29.18	20.069
29	10.27	0.33	5.17	11.50	5.14	0.00	-7.27	8.90	1.32	8.81	15.027
30	5.80	1.00	2.31	6.32	6.00	0.02	-1.78	6.26	4.86	3.94	10.140
31	59.80	0.18	-9.02	60.48	179.41	0.00	-2.33	179.42	177.75	24.46	149.508
32	15.68	6.43	40.46	43.87	7.84	-4.59	117.79	118.14	110.77	41.06	46.865
33	10.60	27.31	1.77	29.35	2.00	77.83	0.75	77.86	73.19	26.55	32.436
34	0.33	10.27	0.49	10.29	0.00	5.14	-0.29	5.14	5.11	0.56	189.754

К2 файл о2к4А