

## 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 см,  $t$  и  $t_1$  — в с).

Кирсанов М.Н. **Решебник. Теоретическая механика**/Под ред. А. И. Кириллова.— М.:ФИЗМАТЛИТ, 2002.— 384 с. (с.137.)

<p><b>Задача 2.1</b> <span style="float: right;">3</span></p> $x = 11(t + 1)^{1/5},$ $y = \frac{13}{2t + 3},$ $z = \frac{1}{2} \sin 6t + 10t, \quad t_1 = 0.9.$	<p><b>Задача 2.2</b> <span style="float: right;">3</span></p> $x = \frac{1}{2} \sin 8t + 7t,$ $y = 6 \ln (2t + 2),$ $z = \frac{10}{3t + 4}, \quad t_1 = 0.6.$	<p><b>Задача 2.3</b> <span style="float: right;">3</span></p> $x = 2 \arcsin(t/2),$ $y = \frac{1}{2} \sin^2 4t - 2t,$ $z = \ln (4t + 2), \quad t_1 = 0.1.$
<p><b>Задача 2.4</b> <span style="float: right;">3</span></p> $x = 4 \arcsin(t/3),$ $y = 2 \ln (2t + 2),$ $z = 4(t + 1)^{3/10}, \quad t_1 = 0.2.$	<p><b>Задача 2.5</b> <span style="float: right;">3</span></p> $x = \frac{1}{2} \sin^2 8t - 2t,$ $y = 3t + \cos^2 4t,$ $z = \frac{1}{2} \sin^2 8t - 2t, \quad t_1 = 0.1.$	<p><b>Задача 2.6</b> <span style="float: right;">3</span></p> $x = 10\sqrt{4t + 10},$ $y = 2 \arcsin(t/10),$ $z = \frac{1}{2} \sin^2 4t - 10t, \quad t_1 = 0.9.$
<p><b>Задача 2.7</b> <span style="float: right;">3</span></p> $x = \frac{1}{2} \sin 4t + 4t,$ $y = \frac{7}{t + 2},$ $z = 14e^{t/2}, \quad t_1 = 0.3.$	<p><b>Задача 2.8</b> <span style="float: right;">3</span></p> $x = 14e^{t/2},$ $y = t^2 + 4t + 4,$ $z = 4\sqrt{4t + 4}, \quad t_1 = 0.3.$	<p><b>Задача 2.9</b> <span style="float: right;">3</span></p> $x = 4\sqrt{2t + 4},$ $y = 4 \arcsin(t/4),$ $z = 3 \ln (2t + 2), \quad t_1 = 0.3.$
<p><b>Задача 2.10</b> <span style="float: right;">3</span></p> $x = 12e^{t/4},$ $y = \ln (2t + 2),$ $z = 3t^2 + 2t + 2, \quad t_1 = 0.1.$	<p><b>Задача 2.11</b> <span style="float: right;">3</span></p> $x = 3(t + 1)^{1/10},$ $y = \frac{1}{2} \sin^2 4t - 2t,$ $z = 12e^{t/2}, \quad t_1 = 0.1.$	<p><b>Задача 2.12</b> <span style="float: right;">3</span></p> $x = t^2 + 11t + 4,$ $y = 21e^{t/2},$ $z = \frac{1}{2} \sin^2 4t - 11t, \quad t_1 = 1.$
<p><b>Задача 2.13</b> <span style="float: right;">3</span></p> $x = 5 \ln (4t + 2),$ $y = 7(t + 1)^{1/10},$ $z = t^2 + 6t + 4, \quad t_1 = 0.5.$	<p><b>Задача 2.14</b> <span style="float: right;">3</span></p> $x = 20e^{t/3},$ $y = \frac{1}{2} \sin^2 6t - 10t,$ $z = \frac{13}{2t + 3}, \quad t_1 = 0.9.$	<p><b>Задача 2.15</b> <span style="float: right;">3</span></p> $x = 15e^{t/4},$ $y = 4 \ln (2t + 2),$ $z = 3t^2 + 5t + 2, \quad t_1 = 0.4.$

<p><b>Задача 2.16</b> <span style="float: right;">3</span></p> $x = 3\operatorname{tg}(t/2),$ $y = \frac{1}{2}\sin^2 4t - 7t,$ $z = 6 \ln(4t + 2), \quad t_1 = 0.6.$	<p><b>Задача 2.17</b> <span style="float: right;">3</span></p> $x = 3 \ln(3t + 2),$ $y = 4\operatorname{tg}(t/3),$ $z = 3\arcsin(t/4), \quad t_1 = 0.3.$	<p><b>Задача 2.18</b> <span style="float: right;">3</span></p> $x = 11\sqrt{4t + 11},$ $y = 11e^{(t^2)},$ $z = 12(t + 1)^{1/10}, \quad t_1 = 1.$
<p><b>Задача 2.19</b> <span style="float: right;">3</span></p> $x = \frac{10}{2t + 3},$ $y = \frac{1}{2}\sin 6t + 7t,$ $z = 8t + \frac{1}{2}\cos^2 6t, \quad t_1 = 0.6.$	<p><b>Задача 2.20</b> <span style="float: right;">3</span></p> $x = 6e^{(t^2)},$ $y = 4\operatorname{tg}(t/3),$ $z = \frac{1}{2}\sin 6t + 6t, \quad t_1 = 0.5.$	<p><b>Задача 2.21</b> <span style="float: right;">3</span></p> $x = \frac{10}{2t + 3},$ $y = 4\operatorname{tg}(t/3),$ $z = \frac{1}{2}\sin 6t + 7t, \quad t_1 = 0.6.$
<p><b>Задача 2.22</b> <span style="float: right;">3</span></p> $x = \frac{10}{2t + 3},$ $y = 4\operatorname{tg}(t/3),$ $z = 7\sqrt{3t + 7}, \quad t_1 = 0.6.$	<p><b>Задача 2.23</b> <span style="float: right;">3</span></p> $x = 6 \ln(4t + 2),$ $y = t^2 + 7t + 4,$ $z = 2\arcsin(t/7), \quad t_1 = 0.6.$	<p><b>Задача 2.24</b> <span style="float: right;">3</span></p> $x = 10(t + 1)^{1/10},$ $y = 2\arcsin(t/9),$ $z = \frac{12}{t + 2}, \quad t_1 = 0.8.$
<p><b>Задача 2.25</b> <span style="float: right;">3</span></p> $x = t^2 + 2t + 4,$ $y = \frac{5}{t + 2},$ $z = \frac{1}{2}\sin^2 4t - 2t, \quad t_1 = 0.1.$	<p><b>Задача 2.26</b> <span style="float: right;">3</span></p> $x = 19e^{t/2},$ $y = \frac{1}{2}\sin 4t + 9t,$ $z = 10t + \frac{1}{4}\cos^2 8t, \quad t_1 = 0.8.$	<p><b>Задача 2.27</b> <span style="float: right;">3</span></p> $x = \frac{1}{2}\sin 6t + 5t,$ $y = 6(t + 1)^{1/5},$ $z = 15e^{t/3}, \quad t_1 = 0.4.$
<p><b>Задача 2.28</b> <span style="float: right;">3</span></p> $x = \frac{1}{2}\sin^2 8t - 7t,$ $y = 7\sqrt{2t + 7},$ $z = 8t + \cos^2 4t, \quad t_1 = 0.6.$	<p><b>Задача 2.29</b> <span style="float: right;">3</span></p> $x = 4\operatorname{tg}(t/3),$ $y = 19e^{t/3},$ $z = 9\sqrt{3t + 9}, \quad t_1 = 0.8.$	<p><b>Задача 2.30</b> <span style="float: right;">3</span></p> $x = 11e^{(t^2)},$ $y = \frac{14}{3t + 4},$ $z = 12t + \cos^2 4t, \quad t_1 = 1.$

## Декартовы координаты. Пространственная траектория

№	$v_x$	$v_y$	$v_z$	$v$	$a_x$	$a_y$	$a_z$	$a$	$a_\tau$	$a_n$	$R$
1	1.32	-1.13	11.90	12.03	-0.55	0.94	13.91	13.95	13.62	3.05	47.485
2	7.35	3.75	-0.89	8.30	31.88	-2.34	0.92	31.98	27.07	17.02	4.048
3	1.00	-0.57	1.67	2.02	0.03	11.15	-2.78	11.49	-5.39	10.15	0.404
4	1.34	1.67	1.06	2.38	0.03	-1.39	-0.62	1.52	-1.23	0.90	6.340
5	2.00	0.13	2.00	2.83	-1.87	-22.29	-1.87	22.45	-3.67	22.15	0.361
6	5.42	0.20	-8.41	10.01	-0.80	0.00	9.73	9.77	-8.61	4.61	21.755
7	4.72	-1.32	8.13	9.50	-7.46	1.15	4.07	8.57	-0.39	8.56	10.537
8	8.13	4.60	3.51	9.98	4.07	2.00	-1.35	4.73	3.76	2.87	34.763
9	1.87	1.00	2.31	3.13	-0.41	0.02	-1.78	1.82	-1.54	0.97	10.150
10	3.08	0.91	2.60	4.13	0.77	-0.83	6.00	6.11	4.17	4.46	3.822
11	0.28	-0.57	6.31	6.34	-0.23	11.15	3.15	11.59	2.13	11.39	3.528
12	13.00	17.31	-9.02	23.45	2.00	8.66	-2.33	9.18	8.39	3.73	147.544
13	5.00	0.49	7.00	8.62	-5.00	-0.29	2.00	5.39	-1.29	5.24	14.179
14	9.00	-12.94	-1.13	15.80	3.00	-7.00	0.94	7.67	7.37	2.12	117.672
15	4.14	2.86	7.40	8.95	1.04	-2.04	6.00	6.42	4.79	4.28	18.724
16	1.64	-8.99	5.45	10.64	0.51	1.40	-4.96	5.18	-3.64	3.68	30.817
17	3.10	1.35	0.75	3.47	-3.21	0.09	0.01	3.21	-2.84	1.51	7.976
18	5.68	59.80	0.64	60.07	-0.76	179.41	-0.29	179.41	178.52	17.85	202.129
19	-1.13	4.31	5.62	7.17	1.08	7.97	-21.90	23.33	-12.54	19.67	2.615
20	7.70	1.37	3.03	8.39	23.11	0.15	-2.54	23.25	20.33	11.29	6.237
21	-1.13	1.39	4.31	4.67	1.08	0.19	7.97	8.04	7.15	3.68	5.918
22	-1.13	1.39	3.54	3.97	1.08	0.19	-0.60	1.25	-0.78	0.98	16.108
23	5.45	8.20	0.29	9.85	-4.96	2.00	0.00	5.35	-1.08	5.24	18.538
24	0.59	0.22	-1.53	1.66	-0.29	0.00	1.09	1.13	-1.12	0.19	14.129
25	2.20	-1.13	-0.57	2.54	2.00	1.08	11.15	11.38	-1.23	11.31	0.570
26	14.17	7.00	9.54	18.46	7.09	0.47	-31.13	31.93	-10.46	30.17	11.299
27	2.79	0.92	5.71	6.42	-12.16	-0.52	1.90	12.32	-3.66	11.76	3.507
28	-7.70	2.44	11.98	14.45	-63.02	-0.30	-2.80	63.08	31.19	54.83	3.809
29	1.43	8.27	4.00	9.30	0.26	2.76	-0.53	2.82	2.27	1.68	51.563
30	59.80	-0.86	8.04	60.35	179.41	0.73	4.66	179.47	178.40	19.57	186.060