Декартовы координаты. Пространственая 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. 9

$x = \dfrac{11}{2t+3}$,
$y = 8e^{(t^2)}$,
$z = 9(t+1)^{1/5}$, $t_1 = 0.7$.

Задача К2.2. 9

$x = 10\sqrt{2t+10}$,
$y = 5\mathrm{tg}(t/4)$,
$z = 20e^{t/4}$, $t_1 = 0.9$.

Задача К2.3. 9

$x = \dfrac{6}{t+2}$,
$y = 4(t+1)^{1/10}$,
$z = 3e^{(t^2)}$, $t_1 = 0.2$.

Задача К2.4. 9

$x = \frac{1}{2}\sin^2 8t - 3t$,
$y = 3\sqrt{2t+3}$,
$z = 2\ln(2t+2)$, $t_1 = 0.2$.

Задача К2.5. 9

$x = 7\sqrt{3t+7}$,
$y = 2t^2 + 7t + 3$,
$z = 6\ln(3t+2)$, $t_1 = 0.6$.

Задача К2.6. 9

$x = 12e^{t/4}$,
$y = 5\mathrm{tg}(t/4)$,
$z = 3t + \cos^2 4t$, $t_1 = 0.1$.

Задача К2.7. 9

$x = 2t^2 + 6t + 3$,
$y = 3\arcsin(t/6)$,
$z = \dfrac{9}{2t+3}$, $t_1 = 0.5$.

Задача К2.8. 9

$x = 9t + \frac{1}{2}\cos^2 6t$,
$y = 8\sqrt{3t+8}$,
$z = 2t^2 + 8t + 3$, $t_1 = 0.7$.

Задача К2.9. 9

$x = 7e^{(t^2)}$,
$y = \frac{1}{2}\sin 6t + 7t$,
$z = 6\ln(3t+2)$, $t_1 = 0.6$.

Задача К2.10. 9

$x = 18e^{t/4}$,
$y = 7\ln(2t+2)$,
$z = 8\sqrt{2t+8}$, $t_1 = 0.7$.

Задача К2.11. 9

$x = 9(t+1)^{1/10}$,
$y = 18e^{t/2}$,
$z = \frac{1}{2}\sin^2 4t - 8t,\ t_1 = 0.7.$

Задача К2.12. 9

$x = 9e^{(t^2)}$,
$y = \frac{1}{2}\sin^2 4t - 9t$,
$z = 10t + \frac{1}{4}\cos^2 8t,\ t_1 = 0.8.$

Задача К2.13. 9

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

Задача К2.14. 9

$x = 8t + \frac{1}{4}\cos^2 8t$,
$y = 2\arcsin(t/7)$,
$z = 3\mathrm{tg}(t/2),\ t_1 = 0.6.$

Задача К2.15. 9

$x = 3\arcsin(t/4)$,
$y = 4\sqrt{3t+4}$,
$z = 14e^{t/3},\ t_1 = 0.3.$

Задача К2.16. 9

$x = 8\sqrt{2t+8}$,
$y = \frac{1}{2}\sin^2 8t - 8t$,
$z = 9(t+1)^{3/10},\ t_1 = 0.7.$

Задача К2.17. 9

$x = \frac{1}{2}\sin^2 8t - 6t$,
$y = 6e^{(t^2)}$,
$z = 7t + \cos^2 4t,\ t_1 = 0.5.$

Задача К2.18. 9

$x = 19e^{t/2}$,
$y = 9\sqrt{4t+9}$,
$z = 10t + \frac{1}{4}\cos^2 8t,\ t_1 = 0.8.$

Задача К2.19. 9

$x = 12t + \cos^2 4t$,
$y = 12(t+1)^{3/10}$,
$z = 3t^2 + 11t + 2,\ t_1 = 1.$

Задача К2.20. 9

$x = 3e^{(t^2)}$,
$y = \frac{1}{2}\sin^2 4t - 3t$,
$z = 3\mathrm{tg}(t/2),\ t_1 = 0.2.$

Задача К2.21. 9

$x = 2e^{(t^2)}$,
$y = \frac{1}{2}\sin^2 4t - 2t$,
$z = 2\arcsin(t/2),\ t_1 = 0.1.$

Задача К2.22. 9

$x = 21e^{t/4}$,
$y = 3t^2 + 11t + 2$,
$z = \dfrac{14}{3t+4},\ t_1 = 1.$

Задача К2.23. 9

$x = 2\arcsin(t/5)$,
$y = 3\mathrm{tg}(t/2)$,
$z = 4\ln(4t+2)$, $t_1 = 0.4$.

Задача К2.24. 9

$x = 3\mathrm{tg}(t/2)$,
$y = 5e^{(t^2)}$,
$z = 5\sqrt{4t+5}$, $t_1 = 0.4$.

Задача К2.25. 9

$x = 4\arcsin(t/8)$,
$y = 5\mathrm{tg}(t/4)$,
$z = \frac{1}{2}\sin 8t + 8t$, $t_1 = 0.7$.

Задача К2.26. 9

$x = 14e^{t/3}$,
$y = 3\arcsin(t/4)$,
$z = 5(t+1)^{1/5}$, $t_1 = 0.3$.

Задача К2.27. 9

$x = \frac{1}{2}\sin^2 8t - 4t$,
$y = 3t^2 + 4t + 2$,
$z = \frac{1}{2}\sin 8t + 4t$, $t_1 = 0.3$.

Задача К2.28. 9

$x = 11t + \frac{1}{4}\cos^2 8t$,
$y = 20e^{t/2}$,
$z = 2\arcsin(t/10)$, $t_1 = 0.9$.

Задача К2.29. 9

$x = t^2 + 4t + 4$,
$y = 4e^{(t^2)}$,
$z = \frac{1}{2}\sin^2 4t - 4t$, $t_1 = 0.3$.

Задача К2.30. 9

$x = 10\sqrt{4t+10}$,
$y = 11(t+1)^{1/10}$,
$z = 11t + \frac{1}{4}\cos^2 8t$, $t_1 = 0.9$.

Задача К2.31. 9

$x = 16e^{t/4}$,
$y = 5\ln(2t+2)$,
$z = \frac{1}{2}\sin 8t + 6t$, $t_1 = 0.5$.

Задача К2.32. 9

$x = 2\sqrt{4t+2}$,
$y = 2\arcsin(t/2)$,
$z = 3\mathrm{tg}(t/2)$, $t_1 = 0.1$.

Задача К2.33. 9

$x = 5e^{(t^2)}$,
$y = 6(t+1)^{1/10}$,
$z = \frac{1}{2}\sin^2 4t - 5t$, $t_1 = 0.4$.

Задача К2.34. 9

$x = 10e^{(t^2)}$,
$y = 9\ln(2t+2)$,
$z = \frac{1}{2}\sin 8t + 10t$, $t_1 = 0.9$.

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

№	v_x	v_y	v_z	v	a_x	a_y	a_z	a	a_τ	a_n	R
1	−1.14	18.28	1.18	18.36	1.03	51.71	−0.55	51.73	51.41	5.73	58.768
2	2.91	1.32	6.26	7.03	−0.25	0.15	1.57	1.59	1.32	0.89	55.576
3	−1.24	0.34	1.25	1.79	1.13	−0.25	6.74	6.84	3.87	5.64	0.569
4	−3.23	1.63	1.67	3.99	−63.89	−0.48	−1.39	63.91	51.07	38.43	0.413
5	3.54	9.40	4.74	11.11	−0.60	4.00	−3.74	5.51	1.60	5.27	23.393
6	3.08	1.25	0.13	3.32	0.77	0.02	−22.29	22.31	−0.16	22.31	0.495
7	8.00	0.50	−1.13	8.09	4.00	0.01	1.13	4.16	3.80	1.69	38.845
8	6.44	3.78	10.80	13.13	18.69	−0.56	4.00	19.13	12.30	14.65	11.763
9	12.04	4.31	4.74	13.64	34.51	7.97	−3.74	35.62	31.69	16.26	11.437
10	5.36	4.12	2.61	7.25	1.34	−2.42	−0.28	2.78	−0.48	2.74	19.164
11	0.56	12.77	−9.26	15.79	−0.30	6.39	12.41	13.96	−2.13	13.80	18.064
12	27.31	−8.77	9.54	30.23	77.83	15.89	−31.13	85.32	55.89	64.47	14.172
13	0.50	6.30	8.00	10.20	0.01	2.10	4.00	4.52	4.44	0.85	122.054
14	8.35	0.29	1.64	8.51	31.51	0.00	0.51	31.51	31.00	5.68	12.753
15	0.75	2.71	5.16	5.87	0.01	−0.83	1.72	1.91	1.13	1.54	22.412
16	2.61	−11.92	1.86	12.34	−0.28	12.99	−0.77	13.02	−12.72	2.77	55.061
17	−2.04	7.70	10.03	12.81	−9.31	23.11	20.92	32.53	31.76	7.05	23.275
18	14.17	5.15	9.54	17.84	7.09	−0.84	−31.13	31.94	−11.25	29.89	10.652
19	8.04	2.22	17.00	18.94	4.66	−0.78	6.00	7.63	7.27	2.32	154.570
20	1.25	−1.00	1.52	2.20	6.74	−0.47	0.15	6.76	4.14	5.35	0.908
21	0.40	−0.57	1.00	1.22	4.12	11.15	0.03	11.88	−3.78	11.27	0.132
22	6.74	17.00	−0.86	18.31	1.69	6.00	0.73	6.28	6.16	1.21	276.930
23	0.40	1.56	4.44	4.73	0.01	0.32	−4.94	4.95	−4.54	1.98	11.317
24	1.56	4.69	3.89	6.29	0.32	15.49	−1.18	15.54	10.90	11.07	3.578
25	0.50	1.29	11.10	11.19	0.01	0.11	20.20	20.20	20.06	2.39	52.361
26	5.16	0.75	0.81	5.27	1.72	0.01	−0.50	1.79	1.61	0.79	35.210
27	−7.98	5.80	1.05	9.92	5.60	6.00	−21.61	23.12	−3.29	22.89	4.304
28	9.07	15.68	0.20	18.12	8.31	7.84	0.00	11.43	10.95	3.27	100.247
29	4.60	2.63	−2.65	5.92	2.00	10.33	−11.80	15.81	11.41	10.94	3.206
30	5.42	0.62	9.07	10.58	−0.80	−0.29	8.31	8.36	6.70	5.00	22.412
31	4.53	3.33	3.39	6.57	1.13	−2.22	24.22	24.35	12.14	21.10	2.043
32	2.58	1.00	1.50	3.15	−2.15	0.03	0.08	2.15	−1.72	1.30	7.660
33	4.69	0.44	−5.12	6.96	15.49	−0.28	−15.97	22.25	22.18	1.81	26.752
34	40.46	4.74	12.43	42.59	117.79	−2.49	−25.40	120.52	104.21	60.56	29.959

K2 файл o2k9A