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.

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

Задача К2.2.

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

Задача К2.3.

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

Задача К2.4.

$x = \frac{1}{2}\sin 8t + 11t,$
$y = 21e^{t/4},$
$z = 12t + \cos^2 4t,\ t_1 = 1.$

Задача К2.5.

$x = \frac{1}{2}\sin 8t + 4t,$
$y = 5(t+1)^{3/10},$
$z = \dfrac{7}{3t+4},\ t_1 = 0.3.$

Задача К2.6.

$x = 7\sqrt{2t+7},$
$y = 8t + \cos^2 4t,$
$z = 3t^2 + 7t + 2,\ t_1 = 0.6.$

Задача К2.7.

$x = 4\mathrm{tg}(t/3),$
$y = 2\sqrt{3t+2},$
$z = \dfrac{5}{2t+3},\ t_1 = 0.1.$

Задача К2.8.

$x = \frac{1}{2}\sin^2 6t - 4t,$
$y = 4\mathrm{tg}(t/3),$
$z = 5(t+1)^{1/5},\ t_1 = 0.3.$

Задача К2.9.

$x = \frac{1}{2}\sin 4t + 9t,$
$y = \dfrac{12}{t+2},$
$z = 2\arcsin(t/9),\ t_1 = 0.8.$

Задача К2.10.

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

Задача К2.11. 3

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

Задача К2.12. 3

$x = \frac{1}{2}\sin^2 8t - 2t$,
$y = 12e^{t/4}$,
$z = \frac{1}{2}\sin 8t + 2t,\ t_1 = 0.1.$

Задача К2.13. 3

$x = 18e^{t/3}$,
$y = 7\ln(3t+2)$,
$z = \frac{1}{2}\sin 6t + 8t,\ t_1 = 0.7.$

Задача К2.14. 3

$x = 6\sqrt{3t+6}$,
$y = 7t + \frac{1}{2}\cos^2 6t$,
$z = 3\arcsin(t/6),\ t_1 = 0.5.$

Задача К2.15. 3

$x = 2\sqrt{2t+2}$,
$y = 4\arcsin(t/2)$,
$z = 5\mathrm{tg}(t/4),\ t_1 = 0.1.$

Задача К2.16. 3

$x = 4\arcsin(t/4)$,
$y = \dfrac{7}{3t+4}$,
$z = \frac{1}{2}\sin^2 8t - 4t,\ t_1 = 0.3.$

Задача К2.17. 3

$x = 3t + \cos^2 4t$,
$y = 2\sqrt{2t+2}$,
$z = 2e^{(t^2)},\ t_1 = 0.1.$

Задача К2.18. 3

$x = 6(t+1)^{1/5}$,
$y = 4\mathrm{tg}(t/3)$,
$z = 5\sqrt{3t+5},\ t_1 = 0.4.$

Задача К2.19. 3

$x = 2t^2 + 10t + 3$,
$y = 10e^{(t^2)}$,
$z = 11(t+1)^{1/5},\ t_1 = 0.9.$

Задача К2.20. 3

$x = \frac{1}{2}\sin 8t + 4t$,
$y = 4\arcsin(t/4)$,
$z = 5\mathrm{tg}(t/4),\ t_1 = 0.3.$

Задача К2.21. 3

$x = \frac{1}{2}\sin 4t + 4t$,
$y = 4e^{(t^2)}$,
$z = 5(t+1)^{1/10},\ t_1 = 0.3.$

Задача К2.22. 3

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

Задача К2.23. 3

$x = 9\ln(4t+2)$,
$y = 11(t+1)^{1/10}$,
$z = \frac{1}{2}\sin 4t + 10t,\ t_1 = 0.9.$

Задача К2.24. 3

$x = \frac{1}{2}\sin 4t + 4t$,
$y = 3\mathrm{tg}(t/2)$,
$z = 2\arcsin(t/4),\ t_1 = 0.3.$

Задача К2.25. 3

$x = 2e^{(t^2)}$,
$y = 12e^{t/4}$,
$z = 2\sqrt{2t+2},\ t_1 = 0.1.$

Задача К2.26. 3

$x = 4\arcsin(t/2)$,
$y = 5\mathrm{tg}(t/4)$,
$z = 2\sqrt{2t+2},\ t_1 = 0.1.$

Задача К2.27. 3

$x = 9\ln(4t+2)$,
$y = \frac{1}{2}\sin^2 4t - 10t$,
$z = 20e^{t/2},\ t_1 = 0.9.$

Задача К2.28. 3

$x = 14e^{t/3}$,
$y = 4e^{(t^2)}$,
$z = 3\ln(3t+2),\ t_1 = 0.3.$

Задача К2.29. 3

$x = 5\mathrm{tg}(t/4)$,
$y = 3t^2 + 11t + 2$,
$z = 10\ln(2t+2),\ t_1 = 1.$

Задача К2.30. 3

$x = 3\arcsin(t/4)$,
$y = 5t + \frac{1}{2}\cos^2 6t$,
$z = \frac{1}{2}\sin^2 6t - 4t,\ t_1 = 0.3.$

Задача К2.31. 3

$x = \frac{1}{2}\sin^2 4t - 3t$,
$y = 3\sqrt{4t+3}$,
$z = 13e^{t/2},\ t_1 = 0.2.$

Задача К2.32. 3

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

Задача К2.33. 3

$x = 5t + \cos^2 4t$,
$y = 4e^{(t^2)}$,
$z = 3t^2 + 4t + 2,\ t_1 = 0.3.$

Задача К2.34. 3

$x = 10t + \frac{1}{2}\cos^2 6t$,
$y = 19e^{t/3}$,
$z = 2t^2 + 9t + 3,\ t_1 = 0.8.$

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	7.00	9.54	5.15	12.91	0.47	−31.13	−0.84	31.15	−23.09	20.90	7.968
2	27.31	9.53	4.44	29.27	77.83	−31.78	−2.47	84.11	61.90	56.94	15.041
3	−8.77	5.15	9.54	13.94	15.89	−0.84	−31.13	34.96	−31.60	14.96	12.993
4	10.42	6.74	8.04	14.79	−31.66	1.69	4.66	32.04	−19.00	25.80	8.475
5	1.05	1.25	−0.87	1.85	−21.61	−0.67	1.07	21.65	−13.22	17.14	0.200
6	2.44	11.98	10.60	16.19	−0.30	−2.80	6.00	6.63	1.81	6.38	41.089
7	1.33	1.98	−0.98	2.58	0.03	−1.29	1.22	1.78	−1.44	1.04	6.364
8	−5.33	1.35	0.81	5.55	−32.28	0.09	−0.50	32.29	30.91	9.32	3.310
9	7.00	−1.53	0.22	7.17	0.47	1.09	0.00	1.19	0.22	1.17	44.049
10	0.37	−0.86	6.74	6.81	0.00	0.73	1.69	1.84	1.58	0.94	49.009
11	2.61	1.29	2.61	3.91	−0.28	0.11	−0.28	0.41	−0.33	0.24	64.454
12	2.00	3.08	4.79	6.03	−1.87	0.77	−22.96	23.04	−18.45	13.81	2.634
13	7.58	5.12	6.53	11.24	2.53	−3.75	15.69	16.33	9.11	13.55	9.320
14	3.29	7.84	0.50	8.51	−0.66	−34.57	0.01	34.57	−32.08	12.90	5.619
15	1.35	2.00	1.25	2.72	−0.61	0.05	0.02	0.62	−0.26	0.56	13.258
16	1.00	−0.87	−7.98	8.09	0.02	1.07	5.60	5.70	−5.64	0.85	76.724
17	0.13	1.35	0.40	1.41	−22.29	−0.61	4.12	22.68	−1.47	22.63	0.088
18	0.92	1.36	3.01	3.43	−0.52	0.12	−0.73	0.91	−0.73	0.53	22.056
19	13.60	40.46	1.32	42.71	4.00	117.79	−0.55	117.86	112.86	33.98	53.680
20	1.05	1.00	1.26	1.92	−21.61	0.02	0.05	21.61	−11.78	18.12	0.204
21	4.72	2.63	0.39	5.42	−7.46	10.33	−0.27	12.74	−1.52	12.65	2.322
22	15.68	11.80	40.46	44.97	7.84	2.00	117.79	118.07	109.24	44.80	45.147
23	6.43	0.62	8.21	10.44	−4.59	−0.29	3.54	5.81	−0.06	5.81	18.786
24	4.72	1.53	0.50	4.99	−7.46	0.23	0.01	7.46	−6.98	2.62	9.505
25	0.40	3.08	1.35	3.38	4.12	0.77	−0.61	4.24	0.95	4.13	2.771
26	2.00	1.25	1.35	2.72	0.05	0.02	−0.61	0.62	−0.26	0.56	13.258
27	6.43	−8.41	15.68	18.92	−4.59	9.73	7.84	13.32	0.61	13.30	26.918
28	5.16	2.63	3.10	6.57	1.72	10.33	−3.21	10.95	3.96	10.21	4.224
29	1.33	17.00	5.00	17.77	0.17	6.00	−2.50	6.50	5.05	4.10	77.079
30	0.75	6.33	−5.33	8.31	0.01	32.28	−32.28	45.66	45.30	5.66	12.179
31	−1.00	3.08	7.18	7.88	−0.47	−1.62	3.59	3.97	2.70	2.91	21.360
32	5.36	0.50	4.12	6.78	1.34	0.01	−2.42	2.77	−0.41	2.74	16.783
33	2.30	2.63	5.80	6.77	23.60	10.33	6.00	26.45	17.16	20.13	2.277
34	10.52	8.27	12.20	18.11	35.45	2.76	4.00	35.78	24.55	26.03	12.600

K2 файл o2k3A