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. 2

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

Задача К2.2. 2

$x = \frac{1}{2}\sin^2 8t - 8t$,
$y = 3t^2 + 8t + 2$,
$z = 9t + \cos^2 4t,\ t_1 = 0.7.$

Задача К2.3. 2

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

Задача К2.4. 2

$x = 3(t+1)^{1/10}$,
$y = t^2 + 2t + 4$,
$z = 3t + \frac{1}{4}\cos^2 8t,\ t_1 = 0.1.$

Задача К2.5. 2

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

Задача К2.6. 2

$x = \frac{1}{2}\sin^2 6t - 9t$,
$y = 9\sqrt{3t+9}$,
$z = 4\mathrm{tg}(t/3),\ t_1 = 0.8.$

Задача К2.7. 2

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

Задача К2.8. 2

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

Задача К2.9. 2

$x = \frac{1}{2}\sin 4t + 8t$,
$y = \dfrac{11}{t+2}$,
$z = 9t + \frac{1}{4}\cos^2 8t,\ t_1 = 0.7.$

Задача К2.10. 2

$x = 7e^{(t^2)}$,
$y = 17e^{t/3}$,
$z = 8(t+1)^{1/5},\ t_1 = 0.6.$

Задача К2.11. 2

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

Задача К2.12. 2

$x = \frac{1}{2}\sin^2 8t - 7t,$
$y = \dfrac{10}{3t+4},$
$z = 7e^{(t^2)},\ t_1 = 0.6.$

Задача К2.13. 2

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

Задача К2.14. 2

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

Задача К2.15. 2

$x = \dfrac{9}{2t+3},$
$y = 7t + \frac{1}{2}\cos^2 6t,$
$z = \frac{1}{2}\sin^2 6t - 6t,\ t_1 = 0.5.$

Задача К2.16. 2

$x = 11e^{(t^2)},$
$y = 21e^{t/2},$
$z = \frac{1}{2}\sin^2 4t - 11t,\ t_1 = 1.$

Задача К2.17. 2

$x = 21e^{t/4},$
$y = 3t^2 + 11t + 2,$
$z = 10\ln(2t+2),\ t_1 = 1.$

Задача К2.18. 2

$x = 3t^2 + 9t + 2,$
$y = \frac{1}{2}\sin^2 8t - 9t,$
$z = \dfrac{12}{3t+4},\ t_1 = 0.8.$

Задача К2.19. 2

$x = 3t^2 + 3t + 2,$
$y = 2\ln(2t+2),$
$z = 5\mathrm{tg}(t/4),\ t_1 = 0.2.$

Задача К2.20. 2

$x = \frac{1}{2}\sin^2 8t - 9t,$
$y = 3t^2 + 9t + 2,$
$z = \dfrac{12}{3t+4},\ t_1 = 0.8.$

Задача К2.21. 2

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

Задача К2.22. 2

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

Задача К2.23. 2

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

Задача К2.24. 2

$x = 8t + \frac{1}{2}\cos^2 6t$,
$y = 7e^{(t^2)}$,
$z = 4\mathrm{tg}(t/3),\ t_1 = 0.6.$

Задача К2.25. 2

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

Задача К2.26. 2

$x = 6(t+1)^{1/5}$,
$y = 15e^{t/3}$,
$z = 4\mathrm{tg}(t/3),\ t_1 = 0.4.$

Задача К2.27. 2

$x = 13e^{t/2}$,
$y = 3\sqrt{4t+3}$,
$z = 4(t+1)^{1/10},\ t_1 = 0.2.$

Задача К2.28. 2

$x = 4\mathrm{tg}(t/3)$,
$y = \frac{1}{2}\sin 6t + 4t$,
$z = \dfrac{7}{2t+3},\ t_1 = 0.3.$

Задача К2.29. 2

$x = 7(t+1)^{1/5}$,
$y = 4\mathrm{tg}(t/3)$,
$z = 3\arcsin(t/6),\ t_1 = 0.5.$

Задача К2.30. 2

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

Задача К2.31. 2

$x = 4(t+1)^{1/10}$,
$y = 2\ln(4t+2)$,
$z = \frac{1}{2}\sin 4t + 3t,\ t_1 = 0.2.$

Задача К2.32. 2

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

Задача К2.33. 2

$x = 4\ln(3t+2)$,
$y = 5e^{(t^2)}$,
$z = \dfrac{8}{2t+3},\ t_1 = 0.4.$

Задача К2.34. 2

$x = 4\mathrm{tg}(t/3)$,
$y = 6e^{(t^2)}$,
$z = \dfrac{9}{2t+3},\ t_1 = 0.5.$

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	5.15	6.15	10.60	13.30	−0.84	−4.73	2.00	5.21	−0.92	5.13	34.493
2	−11.92	12.20	11.53	20.58	12.99	6.00	−24.82	28.65	−17.86	22.40	18.915
3	−0.87	1.25	1.05	1.85	1.07	−0.67	−21.61	21.65	−13.22	17.14	0.200
4	0.28	2.20	1.00	2.43	−0.23	2.00	0.93	2.22	2.17	0.47	12.479
5	−8.41	15.68	8.21	19.60	9.73	7.84	3.54	12.99	3.58	12.49	30.755
6	−9.52	4.00	1.43	10.43	−35.45	−0.53	0.26	35.45	32.21	14.82	7.338
7	9.07	0.62	5.42	10.58	8.31	−0.29	−0.80	8.36	6.70	5.00	22.412
8	3.75	10.60	3.75	11.85	−2.34	6.00	−2.34	6.85	3.88	5.65	24.870
9	6.12	−1.51	10.96	12.64	−2.68	1.12	−6.50	7.12	−7.06	0.87	183.492
10	12.04	6.92	1.10	13.93	34.51	2.31	−0.55	34.60	30.93	15.49	12.526
11	3.39	−2.04	0.67	4.01	24.22	−9.31	0.01	25.95	25.19	6.22	2.586
12	−7.70	−0.89	12.04	14.32	−63.02	0.92	34.51	71.86	62.85	34.84	5.883
13	1.35	0.91	0.40	1.68	−0.61	−0.83	4.12	4.25	0.05	4.25	0.661
14	−0.87	1.25	1.26	1.98	1.07	−0.67	0.05	1.27	−0.87	0.92	4.243
15	−1.13	7.84	−6.84	10.46	1.13	−34.57	34.57	48.90	−48.61	5.30	20.663
16	59.80	17.31	−9.02	62.91	179.41	8.66	−2.33	179.63	173.27	47.39	83.503
17	6.74	17.00	5.00	18.96	1.69	6.00	−2.50	6.71	5.32	4.10	87.725
18	13.80	−8.07	−0.88	16.01	6.00	62.26	0.82	62.56	−26.27	56.77	4.516
19	4.20	1.67	1.25	4.69	6.00	−1.39	0.03	6.16	4.89	3.75	5.870
20	−8.07	13.80	−0.88	16.01	62.26	6.00	0.82	62.56	−26.27	56.77	4.516
21	1.49	6.00	59.80	60.12	0.34	−3.60	179.41	179.44	178.10	21.88	165.229
22	9.07	8.21	11.80	16.99	8.31	3.54	2.00	9.26	7.53	5.37	53.739
23	14.17	0.59	7.00	15.82	7.09	−0.29	0.47	7.11	6.54	2.77	90.230
24	5.62	12.04	1.39	13.36	−21.90	34.51	0.19	40.88	21.91	34.51	5.172
25	6.99	0.39	−2.65	7.49	−2.80	−0.27	−11.80	12.13	1.54	12.03	4.660
26	0.92	5.71	1.36	5.94	−0.52	1.90	0.12	1.98	1.78	0.87	40.619
27	7.18	3.08	0.34	7.82	3.59	−1.62	−0.25	3.95	2.65	2.93	20.906
28	1.35	3.32	−1.08	3.74	0.09	−17.53	1.20	17.57	−15.86	7.55	1.853
29	1.01	1.37	0.50	1.78	−0.54	0.15	0.01	0.56	−0.19	0.53	5.963
30	0.59	14.17	5.15	15.09	−0.29	7.09	−0.84	7.14	6.35	3.26	69.842
31	0.34	2.86	4.39	5.25	−0.25	−4.08	−5.74	7.05	−7.04	0.36	77.652
32	−4.62	5.62	−4.62	8.62	21.90	−21.90	21.90	37.93	−37.76	3.59	20.654
33	3.75	4.69	−1.11	6.11	−3.52	15.49	1.17	15.93	9.53	12.76	2.925
34	1.37	7.70	−1.13	7.91	0.15	23.11	1.13	23.14	22.39	5.85	10.692

K2 файл o2k2A