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 сасантиметрах, 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. $\quad$ 10

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

Задача К2.2. $\quad$ 10

$x = 15e^{t/2},$
$y = t^2 + 5t + 4,$
$z = \frac{1}{2}\sin^2 4t - 5t,\ t_1 = 0.4.$

Задача К2.3. $\quad$ 10

$x = 7(t + 1)^{3/10},$
$y = 3t^2 + 6t + 2,$
$z = \dfrac{9}{3t + 4},\ t_1 = 0.5.$

Задача К2.4. $\quad$ 10

$x = 21e^{t/3},$
$y = 12t + \frac{1}{2}\cos^2 6t,$
$z = \frac{1}{2}\sin^2 6t - 11t,\ t_1 = 1.$

Задача К2.5. $\quad$ 10

$x = 4\mathrm{tg}(t/3),$
$y = \dfrac{12}{2t + 3},$
$z = 2t^2 + 9t + 3,\ t_1 = 0.8.$

Задача К2.6. $\quad$ 10

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

Задача К2.7. $\quad$ 10

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

Задача К2.8. $\quad$ 10

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

Задача К2.9. $\quad$ 10

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

Задача К2.10. $\quad$ 10

$x = \frac{1}{2}\sin^2 6t - 5t,$
$y = 6t + \frac{1}{2}\cos^2 6t,$
$z = \frac{1}{2}\sin 6t + 5t,\ t_1 = 0.4.$

Задача К2.11. 10

$x = 2t^2 + 11t + 3,$
$y = 11e^{(t^2)},$
$z = \frac{1}{2}\sin 6t + 11t,\ t_1 = 1.$

Задача К2.12. 10

$x = 8\ln(3t + 2),$
$y = 9e^{(t^2)},$
$z = 3\arcsin(t/9),\ t_1 = 0.8.$

Задача К2.13. 10

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

Задача К2.14. 10

$x = 4\arcsin(t/5),$
$y = \dfrac{8}{3t + 4},$
$z = \frac{1}{2}\sin 8t + 5t,\ t_1 = 0.4.$

Задача К2.15. 10

$x = 3(t + 1)^{1/5},$
$y = \frac{1}{2}\sin 6t + 2t,$
$z = 2e^{(t^2)},\ t_1 = 0.1.$

Задача К2.16. 10

$x = 2e^{(t^2)},$
$y = 3t + \frac{1}{2}\cos^2 6t,$
$z = \frac{1}{2}\sin^2 6t - 2t,\ t_1 = 0.1.$

Задача К2.17. 10

$x = 8\ln(2t + 2),$
$y = 3t^2 + 9t + 2,$
$z = \frac{1}{2}\sin^2 8t - 9t,\ t_1 = 0.8.$

Задача К2.18. 10

$x = 2\sqrt{3t + 2},$
$y = 2t^2 + 2t + 3,$
$z = \frac{1}{2}\sin 6t + 2t,\ t_1 = 0.1.$

Задача К2.19. 10

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

Задача К2.20. 10

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

Задача К2.21. 10

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

Задача К2.22. 10

$x = \dfrac{6}{3t + 4},$
$y = \frac{1}{2}\sin^2 8t - 3t,$
$z = 2\ln(2t + 2),\ t_1 = 0.2.$

Задача К2.23. <small>10</small>

$x = 4\ln(3t + 2),$
$y = 6t + \frac{1}{2}\cos^2 6t,$
$z = 2t^2 + 5t + 3, \ t_1 = 0.4.$

Задача К2.24. <small>10</small>

$x = 17e^{t/2},$
$y = 6\ln(4t + 2),$
$z = 8t + \frac{1}{4}\cos^2 8t, \ t_1 = 0.6.$

Задача К2.25. <small>10</small>

$x = \dfrac{8}{3t + 4},$
$y = 6(t + 1)^{3/10},$
$z = \dfrac{8}{3t + 4}, \ t_1 = 0.4.$

Задача К2.26. <small>10</small>

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

Задача К2.27. <small>10</small>

$x = 4\arcsin(t/7),$
$y = 8t + \cos^2 4t,$
$z = 8(t + 1)^{3/10}, \ t_1 = 0.6.$

Задача К2.28. <small>10</small>

$x = \frac{1}{2}\sin^2 8t - 3t,$
$y = 3t^2 + 3t + 2,$
$z = 4(t + 1)^{3/10}, \ t_1 = 0.2.$

Задача К2.29. <small>10</small>

$x = \frac{1}{2}\sin^2 4t - 11t,$
$y = 12(t + 1)^{1/10},$
$z = \dfrac{14}{t + 2}, \ t_1 = 1.$

Задача К2.30. <small>10</small>

$x = \dfrac{14}{t + 2},$
$y = 2\arcsin(t/11),$
$z = \frac{1}{2}\sin 4t + 11t, \ t_1 = 1.$

Задача К2.31. <small>10</small>

$x = 9e^{(t^2)},$
$y = 10t + \cos^2 4t,$
$z = \dfrac{12}{3t + 4}, \ t_1 = 0.8.$

Задача К2.32. <small>10</small>

$x = 3\sqrt{4t + 3},$
$y = 3\operatorname{tg}(t/2),$
$z = 3\sqrt{4t + 3}, \ t_1 = 0.2.$

Задача К2.33. <small>10</small>

$x = 4\operatorname{tg}(t/3),$
$y = 2t^2 + 6t + 3,$
$z = 5\ln(3t + 2), \ t_1 = 0.5.$

Задача К2.34. <small>10</small>

$x = 6\ln(2t + 2),$
$y = \frac{1}{2}\sin 8t + 7t,$
$z = 3t^2 + 7t + 2, \ t_1 = 0.6.$

K2 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	−4.62	12.04	3.54	13.37	21.90	34.51	−0.60	40.88	23.35	33.56	5.329
2	9.16	5.80	−5.12	11.99	4.58	2.00	−15.97	16.74	11.28	12.36	11.629
3	1.58	9.00	−0.89	9.18	−0.74	6.00	0.97	6.12	5.66	2.34	36.078
4	9.77	13.61	−12.61	20.97	3.26	−30.38	30.38	43.09	−36.47	22.94	19.165
5	1.43	−1.13	12.20	12.34	0.26	0.99	4.00	4.13	3.90	1.37	111.406
6	1.34	4.20	1.25	4.58	0.03	6.00	6.74	9.03	7.35	5.24	4.003
7	3.51	3.75	−2.65	5.78	−1.35	−4.69	−11.80	12.77	1.55	12.67	2.635
8	2.00	0.13	0.91	2.20	−1.87	−22.29	−0.83	22.39	−3.36	22.13	0.219
9	0.45	4.44	2.76	5.25	0.00	−2.47	−0.26	2.48	−2.23	1.10	25.087
10	−7.99	8.99	2.79	12.34	3.15	−3.15	−12.16	12.95	−7.08	10.84	14.053
11	15.00	59.80	13.88	63.20	4.00	179.41	5.03	179.52	171.82	52.02	76.785
12	5.45	27.31	0.33	27.85	−3.72	77.83	0.00	77.92	75.59	18.91	41.012
13	1.33	5.00	59.80	60.03	0.17	−2.50	179.41	179.42	178.53	17.85	201.893
14	0.80	−0.89	1.01	1.56	0.01	1.02	1.87	2.13	0.63	2.04	1.201
15	0.56	4.48	0.40	4.53	−0.40	−10.16	4.12	10.97	−9.73	5.08	4.036
16	0.40	0.20	0.80	0.92	4.12	−13.04	13.04	18.90	10.25	15.88	0.053
17	4.44	13.80	−8.07	16.59	−2.47	6.00	62.26	62.60	−25.96	56.96	4.835
18	1.98	2.40	4.48	5.45	−1.29	4.00	−10.16	11.00	−7.05	8.44	3.520
19	−1.08	0.75	1.35	1.88	1.20	0.01	0.09	1.20	−0.62	1.03	3.434
20	1.05	2.30	1.25	2.82	−21.61	23.60	−0.67	32.01	10.89	30.10	0.264
21	4.72	4.60	3.51	7.47	−7.46	2.00	−1.35	7.84	−4.12	6.67	8.368
22	−0.85	−3.23	1.67	3.74	1.11	−63.89	−1.39	63.92	54.43	33.51	0.416
23	3.75	8.99	6.60	11.77	−3.52	−3.15	4.00	6.19	−1.28	6.05	22.868
24	11.47	5.45	8.35	15.20	5.74	−4.96	31.51	32.41	19.86	25.62	9.022
25	−0.89	1.42	−0.89	1.90	1.02	−0.71	1.02	1.61	−1.49	0.62	5.848
26	0.75	2.71	2.63	3.85	0.01	−0.83	10.33	10.36	6.47	8.10	1.829
27	0.57	11.98	1.73	12.12	0.01	−2.80	−0.76	2.90	−2.88	0.38	389.959
28	−3.23	4.20	1.06	5.40	−63.89	6.00	−0.62	64.17	42.77	47.85	0.610
29	−9.02	0.64	−1.56	9.18	−2.33	−0.29	1.04	2.56	2.09	1.48	56.773
30	−1.56	0.18	9.69	9.82	1.04	0.00	6.05	6.14	5.81	1.99	48.536
31	27.31	9.53	−0.88	28.94	77.83	−31.78	0.82	84.07	62.95	55.73	15.028
32	3.08	1.52	3.08	4.61	−1.62	0.15	−1.62	2.30	−2.11	0.90	23.691
33	1.37	8.00	4.29	9.18	0.15	4.00	−3.67	5.43	1.79	5.13	16.428
34	3.75	7.35	10.60	13.43	−2.34	31.88	6.00	32.52	21.52	24.38	7.401

K2 файл   o2k10A