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 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.)

Задача 2.1.

$x = \dfrac{14}{3t+4}$,
$y = 12(t+1)^{3/10}$,
$z = 21e^{t/4},\ t_1 = 1.$

Задача 2.2.

$x = 7(t+1)^{1/5}$,
$y = 5\ln(3t+2)$,
$z = 6e^{(t^2)},\ t_1 = 0.5.$

Задача 2.3.

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

Задача 2.4.

$x = 10e^{(t^2)}$,
$y = 9\ln(4t+2)$,
$z = 10\sqrt{4t+10},\ t_1 = 0.9.$

Задача 2.5.

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

Задача 2.6.

$x = 8e^{(t^2)}$,
$y = 4\arcsin(t/8)$,
$z = \dfrac{11}{3t+4},\ t_1 = 0.7.$

Задача 2.7.

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

Задача 2.8.

$x = 8e^{(t^2)}$,
$y = 2t^2 + 8t + 3$,
$z = 3\arcsin(t/8),\ t_1 = 0.7.$

Задача 2.9.

$x = \frac{1}{2}\sin 6t + 5t$,
$y = 15e^{t/3}$,
$z = 4\mathrm{tg}(t/3),\ t_1 = 0.4.$

Задача 2.10.

$x = 20e^{t/3}$,
$y = 10e^{(t^2)}$,
$z = 11(t+1)^{1/5},\ t_1 = 0.9.$

Задача 2.11.

$x = 5\ln(2t+2)$,
$y = 3t^2 + 6t + 2$,
$z = 7(t+1)^{3/10},\ t_1 = 0.5.$

Задача 2.12.

$x = 3\arcsin(t/9)$,
$y = 19e^{t/3}$,
$z = 8\ln(3t+2),\ t_1 = 0.8.$

Задача 2.13.

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

Задача 2.14.

$x = 12e^{t/3}$,
$y = 2e^{(t^2)}$,
$z = 3t + \frac{1}{2}\cos^2 6t,\ t_1 = 0.1.$

Задача 2.15.

$x = \ln(3t+2)$,
$y = 3\arcsin(t/2)$,
$z = 3(t+1)^{1/5},\ t_1 = 0.1.$

Задача 2.16.

$x = 7(t+1)^{1/5},$
$y = \dfrac{9}{2t+3},$
$z = 5\ln(3t+2),\ t_1 = 0.5.$

Задача 2.17.

$x = 6\ln(4t+2),$
$y = 2\arcsin(t/7),$
$z = 8(t+1)^{1/10},\ t_1 = 0.6.$

Задача 2.18.

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

Задача 2.19.

$x = 12e^{t/3},$
$y = 2\sqrt{3t+2},$
$z = 3(t+1)^{1/5},\ t_1 = 0.1.$

Задача 2.20.

$x = \frac{1}{2}\sin^2 6t - 8t,$
$y = 7\ln(3t+2),$
$z = \dfrac{11}{2t+3},\ t_1 = 0.7.$

Задача 2.21.

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

Задача 2.22.

$x = \dfrac{11}{3t+4},$
$y = 4\arcsin(t/8),$
$z = 8\sqrt{2t+8},\ t_1 = 0.7.$

Задача 2.23.

$x = 3(t+1)^{3/10},$
$y = 4\arcsin(t/2),$
$z = \dfrac{5}{3t+4},\ t_1 = 0.1.$

Задача 2.24.

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

Задача 2.25.

$x = \frac{1}{2}\sin^2 8t - 11t,$
$y = 5\mathrm{tg}(t/4),$
$z = 12t + \cos^2 4t,\ t_1 = 1.$

Задача 2.26.

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

Задача 2.27.

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

Задача 2.28.

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

Задача 2.29.

$x = 11e^{(t^2)},$
$y = 12(t+1)^{1/10},$
$z = 21e^{t/2},\ t_1 = 1.$

Задача 2.30.

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

Задача 2.31.

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

Задача 2.32.

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

Задача 2.33.

$x = 2\arcsin(t/10),$
$y = \frac{1}{2}\sin 4t + 10t,$
$z = 3\mathrm{tg}(t/2),\ t_1 = 0.9.$

2.4

Декартовы координаты. Пространственая траектория

№	v_x	v_y	v_z	v	a_x	a_y	a_z	a	a_τ	a_n	R
1	−0.86	2.22	6.74	7.15	0.73	−0.78	1.69	2.00	1.26	1.55	33.034
2	1.01	4.29	7.70	8.87	−0.54	−3.67	23.11	23.41	18.23	14.68	5.363
3	2.31	3.77	5.80	7.29	−1.78	0.94	6.00	6.33	4.70	4.24	12.548
4	40.46	6.43	5.42	41.33	117.79	−4.59	−0.80	117.88	114.51	28.01	60.975
5	0.62	40.46	5.42	40.83	−0.29	117.79	−0.80	117.79	116.62	16.57	100.625
6	18.28	0.50	−0.89	18.31	51.71	0.01	0.87	51.72	51.59	3.66	91.625
7	4.44	5.80	3.89	8.28	−4.94	2.00	−1.18	5.46	−1.80	5.15	13.310
8	18.28	10.80	0.38	21.24	51.71	4.00	0.00	51.87	46.55	22.87	19.718
9	2.79	5.71	1.36	6.50	−12.16	1.90	0.12	12.31	−3.52	11.79	3.583
10	9.00	40.46	1.32	41.47	3.00	117.79	−0.55	117.83	115.56	23.04	74.665
11	3.33	9.00	1.58	9.73	−2.22	6.00	−0.74	6.44	4.67	4.44	21.331
12	0.33	8.27	5.45	9.91	0.00	2.76	−3.72	4.63	0.25	4.62	21.254
13	6.99	0.39	0.50	7.02	−2.80	−0.27	0.01	2.81	−2.80	0.24	205.760
14	4.14	0.40	0.20	4.16	1.38	4.12	−13.04	13.75	1.13	13.70	1.263
15	1.30	1.50	0.56	2.07	−1.70	0.04	−0.40	1.75	−1.16	1.31	3.250
16	1.01	−1.13	4.29	4.55	−0.54	1.13	−3.67	3.88	−3.86	0.36	56.826
17	5.45	0.29	0.52	5.49	−4.96	0.00	−0.29	4.97	−4.96	0.32	94.348
18	8.04	3.05	5.00	9.95	4.66	−0.23	−2.50	5.29	2.44	4.70	21.080
19	4.14	1.98	0.56	4.62	1.38	−1.29	−0.40	1.93	0.63	1.82	11.691
20	−5.44	5.12	−1.14	7.55	−18.69	−3.75	1.03	19.09	10.76	15.78	3.618
21	0.92	2.79	4.69	5.54	−0.52	−12.16	15.49	19.70	6.93	18.44	1.662
22	−0.89	0.50	2.61	2.80	0.87	0.01	−0.28	0.92	−0.53	0.74	10.551
23	0.84	2.00	−0.81	2.32	−0.54	0.05	1.13	1.25	−0.55	1.13	4.768
24	−1.13	8.00	−6.84	10.58	1.13	4.00	34.57	34.81	−19.43	28.89	3.878
25	−12.15	1.33	8.04	14.63	−61.29	0.17	4.66	61.47	53.47	30.31	7.063
26	2.91	7.83	0.40	8.36	−0.25	−19.47	0.00	19.47	−18.31	6.62	10.561
27	7.70	4.24	5.17	10.20	23.11	−1.06	−7.27	24.25	13.33	20.26	5.136
28	15.68	5.42	6.43	17.80	7.84	−0.80	−4.59	9.12	5.01	7.62	41.540
29	59.80	0.64	17.31	62.26	179.41	−0.29	8.66	179.62	174.73	41.62	93.127
30	14.17	7.00	0.22	15.81	7.09	0.47	0.00	7.10	6.56	2.72	91.822
31	4.24	7.70	1.60	8.94	−1.06	23.11	0.41	23.14	19.49	12.48	6.405
32	0.50	3.75	4.60	5.96	0.01	−4.69	2.00	5.10	−1.41	4.90	7.242
33	0.20	8.21	1.85	8.41	0.00	3.54	0.89	3.65	3.65	0.13	560.346