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

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

Задача 2.2

$x = 12t + \frac{1}{2}\cos^2 6t,$
$y = 4\mathrm{tg}(t/3),$
$z = 11\sqrt{3t + 11},\ t_1 = 1.$

Задача 2.3

$x = 14e^{t/3},$
$y = 4e^{(t^2)},$
$z = \dfrac{7}{2t + 3},\ t_1 = 0.3.$

Задача 2.4

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

Задача 2.5

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

Задача 2.6

$x = \frac{1}{2}\sin 6t + 10t,$
$y = 10e^{(t^2)},$
$z = 11t + \frac{1}{2}\cos^2 6t,\ t_1 = 0.9.$

Задача 2.7

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

Задача 2.8

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

Задача 2.9

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

Задача 2.10

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

Задача 2.11

$x = \frac{1}{2}\sin^2 4t - 6t,$
$y = 16e^{t/2},$
$z = 7(t + 1)^{1/10},\ t_1 = 0.5.$

Задача 2.12

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

Задача 2.13

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

Задача 2.14

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

Задача 2.15

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

Задача 2.16

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

Задача 2.17

$x = \frac{1}{2}\sin 6t + 10t,$
$y = 10e^{(t^2)},$
$z = 11(t+1)^{1/5},\ t_1 = 0.9.$

Задача 2.18

$x = 5(t+1)^{1/10},$
$y = 14e^{t/2},$
$z = 5(t+1)^{1/10},\ t_1 = 0.3.$

Задача 2.19

$x = \dfrac{11}{3t+4},$
$y = \frac{1}{2}\sin 8t + 8t,$
$z = 9(t+1)^{3/10},\ t_1 = 0.7.$

Задача 2.20

$x = \frac{1}{2}\sin^2 6t - 7t,$
$y = 6\ln(3t+2),$
$z = 17e^{t/3},\ t_1 = 0.6.$

Задача 2.21

$x = 4\arcsin(t/8),$
$y = 9(t+1)^{3/10},$
$z = 8e^{(t^2)},\ t_1 = 0.7.$

Задача 2.22

$x = \dfrac{5}{2t+3},$
$y = 3t + \frac{1}{2}\cos^2 6t,$
$z = 12e^{t/3},\ t_1 = 0.1.$

Задача 2.23

$x = 4\mathrm{tg}(t/3),$
$y = 3(t+1)^{1/5},$
$z = 2\sqrt{3t+2},\ t_1 = 0.1.$

Задача 2.24

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

Задача 2.25

$x = 3t + \frac{1}{4}\cos^2 8t,$
$y = 2\sqrt{4t+2},$
$z = \dfrac{5}{t+2},\ t_1 = 0.1.$

Задача 2.26

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

Задача 2.27

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

Задача 2.28

$x = 5\mathrm{tg}(t/4),$
$y = 9\sqrt{2t+9},$
$z = 4\arcsin(t/9),\ t_1 = 0.8.$

Задача 2.29

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

Задача 2.30

$x = 4\ln(2t+2),$
$y = 5e^{(t^2)},$
$z = 6(t+1)^{3/10},\ t_1 = 0.4.$

Декартовы координаты. Пространственая траектория

№	v_x	v_y	v_z	v	a_x	a_y	a_z	a	a_τ	a_n	R
1	−0.57	2.20	3.84	4.46	11.15	2.00	−3.12	11.75	−3.11	11.33	1.759
2	13.61	1.49	4.41	14.38	−30.38	0.34	−0.47	30.38	−28.85	9.53	21.720
3	5.16	2.63	−1.08	5.89	1.72	10.33	1.20	10.54	5.89	8.74	3.967
4	1.34	3.80	4.63	6.14	0.06	4.00	1.54	4.29	3.65	2.24	16.794
5	2.00	3.08	1.35	3.91	0.05	0.77	−0.61	0.98	0.42	0.89	17.162
6	11.90	40.46	13.94	44.42	13.91	117.79	7.00	118.81	113.21	36.05	54.740
7	3.42	1.34	1.67	4.03	0.85	0.03	−1.39	1.63	0.16	1.62	10.004
8	1.39	9.40	4.74	10.62	0.19	4.00	−3.74	5.48	1.90	5.14	21.931
9	4.69	4.94	0.44	6.83	15.49	−8.00	−0.28	17.43	4.84	16.75	2.785
10	2.20	1.00	1.00	2.62	2.00	0.93	0.03	2.21	2.05	0.82	8.327
11	−7.51	10.27	0.49	12.74	−10.46	5.14	−0.29	11.66	10.30	5.45	29.751
12	15.68	8.21	0.20	17.70	7.84	3.54	0.00	8.60	8.59	0.51	616.845
13	27.31	0.45	12.97	30.24	77.83	0.00	−3.73	77.92	68.70	36.78	24.859
14	10.27	4.24	5.00	12.19	5.14	−1.06	−5.00	7.25	1.91	6.99	21.247
15	13.00	9.69	−9.02	18.56	2.00	6.05	−2.33	6.79	5.70	3.69	93.241
16	0.64	5.68	−1.56	5.92	−0.29	−0.76	1.04	1.32	−1.03	0.82	42.812
17	11.90	40.46	1.32	42.20	13.91	117.79	−0.55	118.61	116.85	20.34	87.545
18	0.39	8.13	0.39	8.15	−0.27	4.07	−0.27	4.08	4.03	0.66	100.052
19	−0.89	11.10	1.86	11.29	0.87	20.20	−0.77	20.23	19.67	4.76	26.781
20	−4.62	4.74	6.92	9.57	21.90	−3.74	2.31	22.34	−10.75	19.58	4.682
21	0.50	1.86	18.28	18.38	0.01	−0.77	51.71	51.72	51.35	6.16	54.828
22	−0.98	0.20	4.14	4.25	1.22	−13.04	1.38	13.17	0.43	13.17	1.375
23	1.33	0.56	1.98	2.45	0.03	−0.40	−1.29	1.35	−1.12	0.76	7.878
24	0.20	1.50	1.98	2.49	−13.04	0.04	−1.29	13.11	−2.07	12.94	0.480
25	1.00	2.58	−1.13	2.99	0.93	−2.15	1.08	2.58	−1.95	1.69	5.300
26	12.77	4.87	5.83	14.86	6.39	−0.90	−4.86	8.08	3.28	7.38	29.933
27	1.67	3.84	1.00	4.31	−2.78	−3.12	0.03	4.17	−3.85	1.61	11.483
28	1.30	2.76	0.45	3.09	0.13	−0.26	0.00	0.29	−0.18	0.23	41.024
29	6.33	0.75	2.63	6.89	32.28	0.01	10.33	33.90	33.58	4.64	10.240
30	2.86	4.69	1.42	5.68	−2.04	15.49	−0.71	15.64	11.60	10.49	3.073