

Естественные координаты

Точка движется по плоской кривой $y = y(x)$ с постоянной скоростью v . Определить ускорение точки, радиус кривизны траектории и косинус угла наклона касательной к траектории с осью ox при заданном значении x .

Кирсанов М.Н. **Решебник. Теоретическая механика**/Под ред. А. И. Кириллова.– М.:ФИЗМАТЛИТ, 2002.– 384 с. (с.140.)

<p>Задача 3.1 3</p> $y = 5x - 4 \arctan \frac{x}{6},$ <p style="text-align: center;">$v = 2 \text{ м/с}, x = 1 \text{ м.}$</p>	<p>Задача 3.2 3</p> $y = \frac{7x^3 + 4x^2 + 1}{282},$ <p style="text-align: center;">$v = 6 \text{ м/с}, x = 5 \text{ м.}$</p>	<p>Задача 3.3 3</p> $y = \frac{x}{223} (e^{x+1} + 5),$ <p style="text-align: center;">$v = 2 \text{ м/с}, x = 3 \text{ м.}$</p>
<p>Задача 3.4 3</p> $y = 2x \cos \frac{x+4}{9},$ <p style="text-align: center;">$v = 3 \text{ м/с}, x = 3 \text{ м.}$</p>	<p>Задача 3.5 3</p> $y = \frac{83}{x+3},$ <p style="text-align: center;">$v = 6 \text{ м/с}, x = 5 \text{ м.}$</p>	<p>Задача 3.6 3</p> $y = \frac{x}{2022} (e^{x+2} + 5),$ <p style="text-align: center;">$v = 2 \text{ м/с}, x = 4 \text{ м.}$</p>
<p>Задача 3.7 3</p> $y = \frac{35}{\sin(x/5) + 2},$ <p style="text-align: center;">$v = 3 \text{ м/с}, x = 3 \text{ м.}$</p>	<p>Задача 3.8 3</p> $y = \cos \frac{x}{12} + \sin \frac{x}{12},$ <p style="text-align: center;">$v = 35 \text{ м/с}, x = 2 \text{ м.}$</p>	<p>Задача 3.9 3</p> $y = \left(\frac{x}{7}\right)^3 + \frac{43}{x},$ <p style="text-align: center;">$v = 3 \text{ м/с}, x = 5 \text{ м.}$</p>
<p>Задача 3.10 3</p> $y = \frac{1}{3} (e^{x/3} + 3e^{-x/3}),$ <p style="text-align: center;">$v = 4 \text{ м/с}, x = 7 \text{ м.}$</p>	<p>Задача 3.11 3</p> $y = -3x^2 + 38x + 4,$ <p style="text-align: center;">$v = 1 \text{ м/с}, x = 6 \text{ м.}$</p>	<p>Задача 3.12 3</p> $y = \frac{40}{x+2},$ <p style="text-align: center;">$v = 6 \text{ м/с}, x = 4 \text{ м.}$</p>
<p>Задача 3.13 3</p> $y = \frac{x}{5} (\ln(x+2) + 3),$ <p style="text-align: center;">$v = 5 \text{ м/с}, x = 2 \text{ м.}$</p>	<p>Задача 3.14 3</p> $y = \frac{44}{\sin(x/4) + 3},$ <p style="text-align: center;">$v = 3 \text{ м/с}, x = 1 \text{ м.}$</p>	<p>Задача 3.15 3</p> $y = 4 \sin^2 \frac{x}{2} + \cos \frac{x}{2},$ <p style="text-align: center;">$v = 3 \text{ м/с}, x = 1 \text{ м.}$</p>
<p>Задача 3.16 3</p> $y = 31 \cos \frac{x}{11} + \frac{x^2}{5},$ <p style="text-align: center;">$v = 6 \text{ м/с}, x = 6 \text{ м.}$</p>	<p>Задача 3.17 3</p> $y = 19 \frac{x}{x+3},$ <p style="text-align: center;">$v = 6 \text{ м/с}, x = 6 \text{ м.}$</p>	<p>Задача 3.18 3</p> $y = \frac{x}{2021} (e^{x+2} + 4),$ <p style="text-align: center;">$v = 2 \text{ м/с}, x = 4 \text{ м.}$</p>
<p>Задача 3.19 3</p> $y = 27 \ln(x/3 + 1),$ <p style="text-align: center;">$v = 4 \text{ м/с}, x = 6 \text{ м.}$</p>	<p>Задача 3.20 3</p> $y = \frac{x(5 + \sin(x/3))}{5},$ <p style="text-align: center;">$v = 6 \text{ м/с}, x = 6 \text{ м.}$</p>	<p>Задача 3.21 3</p> $y = 9 \frac{x}{x+2},$ <p style="text-align: center;">$v = 5 \text{ м/с}, x = 3 \text{ м.}$</p>
<p>Задача 3.22 3</p> $y = -2x^2 + 20x + 3,$ <p style="text-align: center;">$v = 1 \text{ м/с}, x = 4 \text{ м.}$</p>	<p>Задача 3.23 3</p> $y = \frac{x^2}{2} + \sin \frac{x}{8},$ <p style="text-align: center;">$v = 4 \text{ м/с}, x = 1 \text{ м.}$</p>	<p>Задача 3.24 3</p> $y = \frac{6x^3 + 4x^2 + 1}{44},$ <p style="text-align: center;">$v = 4 \text{ м/с}, x = 2 \text{ м.}$</p>

Задача 3.25 3

$$y = 7 \cos \frac{x}{6} + \frac{x^2}{5},$$

$v = 5 \text{ м/с}, x = 4 \text{ м.}$

Задача 3.26 3

$$y = \frac{22}{x+2},$$

$v = 6 \text{ м/с}, x = 3 \text{ м.}$

Задача 3.27 3

$$y = 5x - 4 \arctan \frac{x}{6},$$

$v = 2 \text{ м/с}, x = 2 \text{ м.}$

Задача 3.28 3

$$y = \frac{x(6 + \cos(x/3))}{5},$$

$v = 6 \text{ м/с}, x = 4 \text{ м.}$

Задача 3.29 3

$$y = 2x \sin \frac{x+2}{6},$$

$v = 4 \text{ м/с}, x = 1 \text{ м.}$

Задача 3.30 3

$$y = \frac{49}{\sin(x/3) + 3},$$

$v = 3 \text{ м/с}, x = 4 \text{ м.}$

Естественные координаты

	y'	y''	v_x	v_y	$\cos(\alpha)$	a_x	a_y	a	R
1	4.351	0.035	0.448	1.949	0.224	-0.002	0.000	0.002	2538.413
2	2.004	0.773	2.679	5.368	0.447	-2.218	1.107	2.479	14.524
3	1.002	1.224	1.413	1.415	0.706	-1.222	1.220	1.727	2.317
4	0.957	-0.365	2.167	2.074	0.722	0.856	-0.894	1.237	7.274
5	-1.297	0.324	3.664	-4.751	0.611	2.105	1.623	2.658	13.546
6	1.000	1.197	1.414	1.414	0.707	-1.197	1.197	1.693	2.363
7	-0.878	0.233	2.254	-1.980	0.751	0.588	0.669	0.890	10.109
8	0.068	-0.008	34.919	2.387	0.998	0.664	-9.709	9.732	125.873
9	-1.501	0.775	1.663	-2.497	0.554	0.990	0.659	1.189	7.570
10	1.113	0.393	2.673	2.976	0.668	-1.395	1.252	1.874	8.536
11	2.000	-6.000	0.447	0.894	0.447	0.480	-0.240	0.537	1.863
12	-1.111	0.370	4.014	-4.460	0.669	2.967	2.670	3.992	9.019
13	0.977	0.075	3.576	3.495	0.715	-0.479	0.491	0.686	36.448
14	-1.011	0.215	2.110	-2.133	0.703	0.479	0.474	0.674	13.350
15	1.443	0.861	1.709	2.466	0.570	-1.177	0.816	1.432	6.285
16	0.938	0.181	4.376	4.105	0.729	-1.730	1.844	2.528	14.240
17	0.704	-0.156	4.907	3.453	0.818	1.772	-2.518	3.079	11.692
18	1.000	1.198	1.414	1.414	0.707	-1.198	1.198	1.694	2.362
19	3.000	-0.333	1.265	3.795	0.316	0.160	-0.053	0.169	94.868
20	1.015	-0.177	4.210	4.275	0.702	1.566	-1.542	2.198	16.379
21	0.720	-0.288	4.058	2.922	0.812	2.248	-3.123	3.848	6.497
22	4.000	-4.000	0.243	0.970	0.243	0.055	-0.014	0.057	17.523
23	1.124	0.998	2.659	2.988	0.665	-3.504	3.117	4.689	3.412
24	2.000	1.818	1.789	3.578	0.447	-2.327	1.164	2.602	6.149
25	0.879	0.247	3.756	3.300	0.751	-1.729	1.968	2.620	9.542
26	-0.880	0.352	4.504	-3.964	0.751	3.542	4.025	5.361	6.715
27	4.400	0.060	0.443	1.950	0.222	-0.003	0.001	0.003	1531.142
28	0.988	-0.151	4.268	4.217	0.711	1.371	-1.388	1.951	18.454
29	1.251	0.558	2.497	3.125	0.624	-1.698	1.357	2.174	7.361
30	-0.244	0.345	2.915	-0.710	0.972	0.674	2.767	2.848	3.160