

Сферическое движение

Твердое тело совершает сферическое движение, заданное углами Эйлера. Найти скорость и ускорение точки, положение которой дано относительно подвижных осей координат.

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<p>Задача 15.1 $\psi = \pi/3, \theta = 4t + (t/4) \cos^2 8t,$ $\varphi = 2 \ln(4t + 2), x = 1, y = 2, z = 4.$</p> <p>$t = 1$ с.</p> <p><small>15.3</small></p>	<p>Задача 15.2 $\psi = 16e^{t/4}, \theta = 5 \ln(2t + 2),$ $\varphi = \pi/2, x = 3, y = 5, z = 2.$</p> <p>$t = 1$ с.</p> <p><small>15.3</small></p>
<p>Задача 15.3 $\psi = 4(t + 1)^{3/10}, \theta = 6/(3t + 4),$ $\varphi = \pi/3, x = 3, y = 2, z = 2.$</p> <p>$t = 3$ с.</p> <p><small>15.3</small></p>	<p>Задача 15.4 $\psi = 6\sqrt{3t + 6}, \theta = \pi/2,$ $\varphi = 6\sqrt{3t + 6}, x = 2, y = 5, z = 4.$</p> <p>$t = 1$ с.</p> <p><small>15.3</small></p>
<p>Задача 15.5 $\psi = \pi/3, \theta = 8(t + 1)^{1/10},$ $\varphi = t^2 + 7t + 4, x = 1, y = 6, z = 4.$</p> <p>$t = 3$ с.</p> <p><small>15.3</small></p>	<p>Задача 15.6 $\psi = 8t + (t/2) \cos^2 6t, \theta = \pi/3,$ $\varphi = (t/2) \sin^2 6t - 7t, x = 2, y = 6, z = 4.$</p> <p>$t = 3$ с.</p> <p><small>15.3</small></p>
<p>Задача 15.7 $\psi = (t/2) \sin^2 8t - 6t, \theta = 16e^{t/4},$ $\varphi = \pi/2, x = 3, y = 5, z = 3.$</p> <p>$t = 1$ с.</p> <p><small>15.3</small></p>	<p>Задача 15.8 $\psi = \pi/2, \theta = 7t + (t/4) \cos^2 8t,$ $\varphi = 7(t + 1)^{1/10}, x = 1, y = 5, z = 4.$</p> <p>$t = 1$ с.</p> <p><small>15.3</small></p>
<p>Задача 15.9 $\psi = 10/(2t + 3), \theta = \pi/3,$ $\varphi = 7\sqrt{3t + 7}, x = 2, y = 6, z = 2.$</p> <p>$t = 3$ с.</p> <p><small>15.3</small></p>	<p>Задача 15.10 $\psi = \pi/6, \theta = 15e^{t/2},$ $\varphi = 8/(t + 2), x = 1, y = 4, z = 4.$</p> <p>$t = 2$ с.</p> <p><small>15.3</small></p>
<p>Задача 15.11 $\psi = 11t + (t/2) \cos^2 6t, \theta = \pi/30,$ $\varphi = 11t + (t/2) \cos^2 6t, x = 2, y = 9, z = 4.$</p> <p>$t = 3$ с.</p> <p><small>15.3</small></p>	<p>Задача 15.12 $\psi = 2\sqrt{2t + 2}, \theta = 3(t + 1)^{3/10},$ $\varphi = \pi/2, x = 3, y = 1, z = 4.$</p> <p>$t = 3$ с.</p> <p><small>15.3</small></p>
<p>Задача 15.13 $\psi = \pi/2, \theta = 7t + (t/4) \cos^2 8t,$ $\varphi = (t/2) \sin 4t + 6t, x = 1, y = 5, z = 4.$</p> <p>$t = 2$ с.</p> <p><small>15.3</small></p>	<p>Задача 15.14 $\psi = 3t^2 + 8t + 2, \theta = (t/2) \sin^2 8t - 8t,$ $\varphi = \pi/1, x = 3, y = 7, z = 3.$</p> <p>$t = 3$ с.</p> <p><small>15.3</small></p>

<p>Задача 15.15 $\psi = \pi/2, \theta = (t/2) \sin^2 4t - 2t,$ $\varphi = t^2 + 2t + 4, x = 1, y = 1, z = 4.$</p> <p>$t = 1$ с.</p> <p>15.3</p>	<p>Задача 15.16 $\psi = (t/2) \sin^2 8t - 8t, \theta = 7 \ln(2t + 2),$ $\varphi = \pi/1, x = 3, y = 7, z = 3.$</p> <p>$t = 1$ с.</p> <p>15.3</p>
<p>Задача 15.17 $\psi = 12e^{t/3}, \theta = \pi/2,$ $\varphi = \ln(3t + 2), x = 2, y = 1, z = 2.$</p> <p>$t = 1$ с.</p> <p>15.3</p>	<p>Задача 15.18 $\psi = \pi/3, \theta = 10/(t + 2),$ $\varphi = (t/2) \sin 4t + 7t, x = 1, y = 6, z = 4.$</p> <p>$t = 1$ с.</p> <p>15.3</p>
<p>Задача 15.19 $\psi = \pi/2, \theta = (t/2) \sin^2 4t - 2t,$ $\varphi = 3t + (t/4) \cos^2 8t, x = 1, y = 1, z = 4.$</p> <p>$t = 1$ с.</p> <p>15.3</p>	<p>Задача 15.20 $\psi = 2t^2 + 9t + 3, \theta = \pi/144,$ $\varphi = (t/2) \sin 6t + 9t, x = 2, y = 8, z = 3.$</p> <p>$t = 2$ с.</p> <p>15.3</p>
<p>Задача 15.21 $\psi = \pi/3, \theta = 8(t + 1)^{1/10},$ $\varphi = 7\sqrt{4t + 7}, x = 1, y = 6, z = 4.$</p> <p>$t = 1$ с.</p> <p>15.3</p>	<p>Задача 15.22 $\psi = (t/2) \sin 8t + 4t, \theta = 7/(3t + 4),$ $\varphi = \pi/4, x = 3, y = 3, z = 1.$</p> <p>$t = 2$ с.</p> <p>15.3</p>
<p>Задача 15.23 $\psi = 7/(3t + 4), \theta = (t/2) \sin^2 8t - 4t,$ $\varphi = \pi/4, x = 3, y = 3, z = 2.$</p> <p>$t = 3$ с.</p> <p>15.3</p>	<p>Задача 15.24 $\psi = 10t + (t/2) \cos^2 6t, \theta = \pi/144,$ $\varphi = (t/2) \sin 6t + 9t, x = 2, y = 8, z = 4.$</p> <p>$t = 3$ с.</p> <p>15.3</p>
<p>Задача 15.25 $\psi = (t/2) \sin 6t + 6t, \theta = \pi/2,$ $\varphi = (t/2) \sin^2 6t - 6t, x = 2, y = 5, z = 1.$</p> <p>$t = 2$ с.</p> <p>15.3</p>	<p>Задача 15.26 $\psi = \pi/3, \theta = 7\sqrt{4t + 7},$ $\varphi = (t/2) \sin 4t + 7t, x = 1, y = 6, z = 4.$</p> <p>$t = 2$ с.</p> <p>15.3</p>
<p>Задача 15.27 $\psi = \pi/2, \theta = 9/(t + 2),$ $\varphi = t^2 + 6t + 4, x = 1, y = 5, z = 4.$</p> <p>$t = 2$ с.</p> <p>15.3</p>	<p>Задача 15.28 $\psi = \pi/3, \theta = 7\sqrt{4t + 7},$ $\varphi = (t/2) \sin 4t + 7t, x = 1, y = 6, z = 4.$</p> <p>$t = 1$ с.</p> <p>15.3</p>
<p>Задача 15.29 $\psi = 12/(3t + 4), \theta = 3t^2 + 9t + 2,$ $\varphi = \pi/144, x = 3, y = 8, z = 2.$</p> <p>$t = 2$ с.</p> <p>15.3</p>	<p>Задача 15.30 $\psi = (t/2) \sin^2 8t - 3t, \theta = 3t^2 + 3t + 2,$ $\varphi = \pi/3, x = 3, y = 2, z = 3.$</p> <p>$t = 1$ с.</p> <p>15.3</p>

Сферическое движение

	v_x	v_y	v_z	v	a_x	a_y	a_z	a
1	5.161	17.878	-10.229	21.235	32.407	64.049	-152.853	142.989
2	-25.470	6.080	23.006	34.857	-46.258	-217.838	6.481	75.633
3	-0.427	0.977	-0.336	1.118	-0.527	-0.195	0.361	0.182
4	-7.076	15.012	-15.227	22.523	-46.984	-81.807	-1.069	42.864
5	-78.486	13.780	-1.048	79.694	-180.763	-1012.380	-24.006	14.428
6	15.776	27.372	-48.947	58.257	-94.159	-616.150	122.834	492.294
7	-19.833	23.945	-20.075	37.009	-142.099	140.906	-549.310	466.641
8	-30.325	-10.060	20.157	37.777	-257.743	-95.672	-172.757	140.538
9	-14.598	5.119	-0.759	15.488	-11.693	-38.075	5.983	3.825
10	-72.152	33.436	-15.398	81.000	247.125	-114.421	-1587.601	67.486
11	-252.206	50.061	13.467	257.479	-1562.525	-7013.961	-11.208	166.405
12	-1.248	2.441	0.326	2.761	0.159	0.939	-2.260	0.582
13	-26.855	-17.819	28.988	43.348	11.578	-234.877	-179.050	160.376
14	-83.068	-31.034	155.481	178.991	-6027.773	-1041.192	-2221.983	2160.026
15	-3.944	4.064	-0.030	5.663	-11.883	-6.980	-3.303	10.361
16	-69.148	36.891	-16.932	80.181	-775.472	-522.546	-148.258	537.441
17	-1.031	-9.957	6.010	11.675	-1.800	-38.322	-47.195	11.526
18	-32.681	9.885	-6.657	34.786	-72.173	-198.160	12.766	18.159
19	-3.564	3.491	0.018	4.989	-42.166	8.633	2.160	36.638
20	-227.733	58.055	-2.992	235.036	-1754.271	-6475.726	24.178	100.259
21	-23.713	4.802	-1.275	24.228	-14.453	-108.123	19.044	14.321
22	-0.163	0.460	-0.891	1.016	-17.380	16.857	0.539	24.091
23	10.066	9.940	-30.008	33.176	-86.416	-97.880	-273.864	192.205
24	-191.536	46.778	2.213	197.178	-1277.776	-4553.665	26.425	161.414
25	50.052	-22.997	14.880	57.057	-124.746	-438.446	-813.732	371.486
26	-53.799	11.769	-4.204	55.231	18.519	-283.971	-341.298	185.751
27	-47.946	10.918	-1.661	49.201	-111.880	-498.840	46.327	30.832
28	-39.762	-10.234	25.292	48.223	-103.158	-286.197	-126.270	135.747
29	1.089	-42.882	169.895	175.227	-171.854	-3565.220	-833.553	81.169
30	-30.752	-1.016	31.430	43.983	-499.062	223.862	-295.023	332.055

	ω_x	ω_y	ω_z	ω	ε_x	ε_y	ε_z	ε
1	-4.136	1.957	1.333	4.766	-25.092	18.621	-0.889	31.259
2	3.101	-2.500	4.094	5.712	11.011	1.250	-6.730	12.965
3	0.122	0.193	0.407	0.467	-0.044	-0.082	-0.050	0.105
4	-2.253	1.981	3.000	4.243	6.318	6.429	-0.500	9.028
5	-0.195	-0.122	13.000	13.002	-1.536	2.562	2.000	3.595
6	-9.087	-2.788	-4.488	10.511	23.993	-91.815	-2.303	94.927
7	-7.097	-5.136	0.885	8.805	-56.274	-1.284	44.033	71.466
8	2.609	-7.112	0.375	7.585	7.885	-29.749	-0.169	30.777
9	-0.058	0.206	2.502	2.511	0.566	0.061	-0.191	0.601
10	-8.484	-18.538	-0.500	20.393	5.027	-13.511	0.250	14.418
11	1.422	-0.335	27.874	27.912	-4.211	-19.982	9.188	22.393
12	-0.697	-0.341	-0.116	0.785	0.048	0.060	0.252	0.264
13	5.882	0.422	5.709	8.208	-24.215	-35.493	-7.915	43.689
14	11.073	-25.990	0.728	28.260	40.969	2.068	287.954	290.861
15	-0.016	0.014	4.000	4.000	-1.699	1.594	2.000	3.070
16	-3.500	-2.523	8.797	9.798	1.750	-47.685	50.086	69.177
17	5.578	-0.216	0.600	5.615	1.730	-3.419	-0.360	3.849
18	-1.048	0.369	5.693	5.800	2.799	5.721	6.054	8.787
19	0.021	0.003	3.576	3.576	2.317	0.241	30.645	30.733
20	-0.333	0.162	28.528	28.530	1.793	3.883	13.657	14.312
21	-0.145	0.403	4.221	4.243	1.768	0.431	-0.767	1.975
22	-0.071	0.226	0.130	0.270	4.267	4.088	7.069	9.214
23	-5.074	4.929	-0.070	7.074	-28.588	29.351	-0.696	40.979
24	0.282	0.022	23.953	23.955	0.346	-3.091	18.123	18.388
25	5.563	6.468	-8.717	12.197	-50.084	55.816	15.270	76.531
26	-1.265	-3.386	6.709	7.621	-22.550	8.938	-7.915	25.515
27	-0.230	0.514	10.000	10.016	5.250	2.039	2.000	5.977
28	3.982	-1.401	5.693	7.087	-8.702	-22.412	6.054	24.793
29	20.991	-0.657	-0.300	21.003	5.864	-6.317	4.349	9.654
30	0.943	-9.848	0.604	9.911	-44.806	-32.797	45.885	72.032