

Сферическое движение

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

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<p>Задача 15.1 $\psi = 9t + (t/2) \cos^2 6t, \theta = \pi/1,$ $\varphi = (t/2) \sin 6t + 8t, x = 2, y = 7, z = 4.$ $t = 3 \text{ с.}$ <small>15.1</small></p>	<p>Задача 15.2 $\psi = 3t^2 + 2t + 2, \theta = 2\sqrt{2t + 2},$ $\varphi = \pi/2, x = 3, y = 1, z = 3.$ $t = 3 \text{ с.}$ <small>15.1</small></p>
<p>Задача 15.3 $\psi = (t/2) \sin^2 8t - 8t, \theta = 7 \ln (2t + 2),$ $\varphi = \pi/1, x = 3, y = 7, z = 3.$ $t = 3 \text{ с.}$ <small>15.1</small></p>	<p>Задача 15.4 $\psi = \pi/2, \theta = 2\sqrt{4t + 2},$ $\varphi = \ln (4t + 2), x = 1, y = 1, z = 4.$ $t = 3 \text{ с.}$ <small>15.1</small></p>
<p>Задача 15.5 $\psi = 6 \ln (2t + 2), \theta = 3t^2 + 7t + 2,$ $\varphi = \pi/3, x = 3, y = 6, z = 3.$ $t = 2 \text{ с.}$ <small>15.1</small></p>	<p>Задача 15.6 $\psi = \pi/6, \theta = (t/2) \sin^2 4t - 5t,$ $\varphi = 6t + (t/4) \cos^2 8t, x = 1, y = 4, z = 4.$ $t = 3 \text{ с.}$ <small>15.1</small></p>
<p>Задача 15.7 $\psi = (t/2) \sin^2 6t - 6t, \theta = \pi/2,$ $\varphi = 9/(2t + 3), x = 2, y = 5, z = 3.$ $t = 3 \text{ с.}$ <small>15.1</small></p>	<p>Задача 15.8 $\psi = 8 \ln (2t + 2), \theta = 12/(3t + 4),$ $\varphi = \pi/144, x = 3, y = 8, z = 3.$ $t = 3 \text{ с.}$ <small>15.1</small></p>
<p>Задача 15.9 $\psi = 6t + (t) \cos^2 4t, \theta = 6(t + 1)^{3/10},$ $\varphi = \pi/6, x = 3, y = 4, z = 4.$ $t = 1 \text{ с.}$ <small>15.1</small></p>	<p>Задача 15.10 $\psi = \pi/30, \theta = 9 \ln (4t + 2),$ $\varphi = 20e^{t/2}, x = 1, y = 9, z = 4.$ $t = 2 \text{ с.}$ <small>15.1</small></p>
<p>Задача 15.11 $\psi = \pi/6, \theta = 6(t + 1)^{1/10},$ $\varphi = 15e^{t/2}, x = 1, y = 4, z = 4.$ $t = 2 \text{ с.}$ <small>15.1</small></p>	<p>Задача 15.12 $\psi = 4 \ln (2t + 2), \theta = (t/2) \sin 8t + 5t,$ $\varphi = \pi/6, x = 3, y = 4, z = 3.$ $t = 3 \text{ с.}$ <small>15.1</small></p>
<p>Задача 15.13 $\psi = 4\sqrt{3t + 4}, \theta = \pi/4,$ $\varphi = 5t + (t/2) \cos^2 6t, x = 2, y = 3, z = 4.$ $t = 3 \text{ с.}$ <small>15.1</small></p>	<p>Задача 15.14 $\psi = 12e^{t/4}, \theta = 5/(3t + 4),$ $\varphi = \pi/2, x = 3, y = 1, z = 2.$ $t = 2 \text{ с.}$ <small>15.1</small></p>

<p>Задача 15.15</p> $\psi = \pi/6, \theta = t^2 + 5t + 4,$ $\varphi = 15e^{t/2}, x = 1, y = 4, z = 4.$ <p>$t = 3$ с.</p> <p>15.1</p>	<p>Задача 15.16</p> $\psi = \pi/6, \theta = 8/(t + 2),$ $\varphi = 6(t + 1)^{1/10}, x = 1, y = 4, z = 4.$ <p>$t = 3$ с.</p> <p>15.1</p>
<p>Задача 15.17</p> $\psi = 3\sqrt{3t + 3}, \theta = \pi/3,$ $\varphi = (t/2) \sin^2 6t - 3t, x = 2, y = 2, z = 4.$ <p>$t = 2$ с.</p> <p>15.1</p>	<p>Задача 15.18</p> $\psi = 2t^2 + 3t + 3, \theta = \pi/3,$ $\varphi = 4t + (t/2) \cos^2 6t, x = 2, y = 2, z = 3.$ <p>$t = 1$ с.</p> <p>15.1</p>
<p>Задача 15.19</p> $\psi = (t/2) \sin^2 6t - 5t, \theta = \pi/6,$ $\varphi = 8/(2t + 3), x = 2, y = 4, z = 3.$ <p>$t = 2$ с.</p> <p>15.1</p>	<p>Задача 15.20</p> $\psi = 7/(2t + 3), \theta = \pi/4,$ $\varphi = (t/2) \sin 6t + 4t, x = 2, y = 3, z = 2.$ <p>$t = 3$ с.</p> <p>15.1</p>
<p>Задача 15.21</p> $\psi = (t/2) \sin^2 8t - 3t, \theta = 4t + (t) \cos^2 4t,$ $\varphi = \pi/3, x = 3, y = 2, z = 3.$ <p>$t = 2$ с.</p> <p>15.1</p>	<p>Задача 15.22</p> $\psi = \pi/2, \theta = \ln(4t + 2),$ $\varphi = (t/2) \sin 4t + 2t, x = 1, y = 1, z = 4.$ <p>$t = 3$ с.</p> <p>15.1</p>
<p>Задача 15.23</p> $\psi = 17e^{t/4}, \theta = (t/2) \sin 8t + 7t,$ $\varphi = \pi/3, x = 3, y = 6, z = 2.$ <p>$t = 1$ с.</p> <p>15.1</p>	<p>Задача 15.24</p> $\psi = 5(t + 1)^{3/10}, \theta = 5t + (t) \cos^2 4t,$ $\varphi = \pi/4, x = 3, y = 3, z = 2.$ <p>$t = 1$ с.</p> <p>15.1</p>
<p>Задача 15.25</p> $\psi = 2t^2 + 10t + 3, \theta = \pi/30,$ $\varphi = 11(t + 1)^{1/5}, x = 2, y = 9, z = 3.$ <p>$t = 2$ с.</p> <p>15.1</p>	<p>Задача 15.26</p> $\psi = 13e^{t/3}, \theta = \pi/3,$ $\varphi = 3\sqrt{3t + 3}, x = 2, y = 2, z = 2.$ <p>$t = 3$ с.</p> <p>15.1</p>
<p>Задача 15.27</p> $\psi = \pi/2, \theta = 3(t + 1)^{1/10},$ $\varphi = 2\sqrt{4t + 2}, x = 1, y = 1, z = 4.$ <p>$t = 2$ с.</p> <p>15.1</p>	<p>Задача 15.28</p> $\psi = \pi/3, \theta = 8(t + 1)^{1/10},$ $\varphi = 6 \ln(4t + 2), x = 1, y = 6, z = 4.$ <p>$t = 1$ с.</p> <p>15.1</p>
<p>Задача 15.29</p> $\psi = 2t^2 + 6t + 3, \theta = \pi/2,$ $\varphi = 5 \ln(3t + 2), x = 2, y = 5, z = 3.$ <p>$t = 3$ с.</p> <p>15.1</p>	<p>Задача 15.30</p> $\psi = 3t^2 + 6t + 2, \theta = (t/2) \sin 8t + 6t,$ $\varphi = \pi/2, x = 3, y = 5, z = 3.$ <p>$t = 2$ с.</p> <p>15.1</p>

Сферическое движение

	v_x	v_y	v_z	v	a_x	a_y	a_z	a
1	13.961	-3.989	-0.000	14.519	-70.333	-10.021	-0.000	64.874
2	-18.325	83.782	-9.602	86.298	-1363.665	-393.873	-987.498	21.663
3	-1.183	18.763	-42.597	46.561	-667.338	21.916	-106.435	201.914
4	-2.345	4.033	-0.422	4.685	0.512	-1.094	-5.341	1.490
5	-36.999	-35.683	108.366	119.939	-1835.260	-951.547	-1056.799	118.055
6	-49.777	26.428	-13.984	58.067	-50.547	-291.583	-538.717	239.894
7	-13.437	22.213	-28.064	38.230	128.032	-200.370	-238.584	16.576
8	-4.856	4.155	-6.223	8.920	-17.243	-7.107	9.671	3.494
9	0.422	-4.726	4.410	6.478	27.273	-16.646	-14.299	21.000
10	-232.861	35.458	-21.566	236.530	-929.479	-6684.488	1285.816	747.557
11	-81.608	21.278	-0.876	84.341	-456.378	-1652.806	-11.437	25.779
12	-6.068	-19.970	32.695	38.789	-118.299	-291.253	5.113	172.766
13	-31.609	16.089	3.738	35.665	-181.727	-249.038	-40.350	54.749
14	-4.041	8.279	1.921	9.411	-37.271	-17.656	20.451	4.731
15	-92.669	47.408	-24.241	106.877	-1442.642	-4583.532	2088.519	1931.449
16	0.043	1.222	-1.233	1.737	-0.393	-0.901	0.245	0.821
17	14.663	-12.086	-1.288	19.045	-80.325	-14.447	-43.297	63.707
18	-22.744	35.834	-8.727	43.331	-160.292	-279.742	-332.488	177.665
19	23.234	-3.488	-10.839	25.874	-54.667	-196.494	75.279	54.318
20	-17.720	11.520	0.440	21.140	-109.358	-75.768	-0.439	50.392
21	-14.823	-5.296	18.354	24.180	-78.302	-235.851	40.650	234.026
22	-3.089	2.714	0.094	4.113	-18.049	-9.051	2.546	8.513
23	-17.521	-9.510	54.811	58.323	115.878	-540.806	-252.213	304.632
24	-4.276	1.328	4.423	6.294	-13.138	-9.945	14.817	21.843
25	-166.960	32.509	13.780	170.653	-638.509	-3160.704	200.312	40.052
26	-25.952	31.178	-5.226	40.901	-179.519	-206.224	-450.713	47.792
27	-1.283	0.819	0.116	1.527	-1.342	-1.732	0.186	0.336
28	-22.336	4.416	-1.040	22.792	-1.181	-98.962	18.864	21.845
29	38.442	32.180	-79.262	93.786	-1187.617	-781.660	-837.434	96.222
30	-74.742	76.152	-52.179	118.778	-1103.733	-1619.468	-899.874	236.878

	ω_x	ω_y	ω_z	ω	ε_x	ε_y	ε_z	ε
1	-0.000	0.000	-1.994	1.994	0.000	0.000	8.911	8.911
2	-11.724	-0.707	16.204	20.012	7.941	0.088	13.151	15.363
3	-1.750	10.116	4.504	11.210	0.437	29.544	34.368	45.323
4	-0.937	-0.515	0.286	1.107	-0.013	0.341	-0.082	0.351
5	9.969	-16.184	-1.925	19.105	-28.835	-23.576	-9.653	38.477
6	-4.723	-4.908	7.537	10.158	-32.281	40.485	20.485	55.684
7	-7.552	-4.849	-0.222	8.978	-2.799	-4.167	0.099	5.021
8	-0.178	1.599	1.207	2.011	0.084	-0.658	0.038	0.664
9	1.871	1.025	0.920	2.324	2.252	4.677	0.076	5.191
10	-2.069	2.946	27.183	27.420	80.911	55.060	13.591	98.808
11	-0.223	-0.015	20.387	20.388	-0.235	4.545	10.194	11.164
12	6.258	-2.554	-0.399	6.771	23.647	-17.000	-6.042	29.743
13	0.554	-1.038	9.152	9.227	-8.344	-4.296	4.471	10.396
14	2.371	0.150	4.341	4.948	-0.058	-0.090	1.441	1.445
15	-3.449	10.445	33.613	35.367	350.470	117.823	16.806	370.127
16	-0.262	0.183	0.172	0.363	0.137	-0.028	-0.039	0.145
17	0.538	1.182	-4.967	5.134	-6.849	2.879	15.145	16.870
18	-5.872	-1.508	9.110	10.942	-11.816	32.076	-28.379	44.428
19	-3.510	-1.601	-7.009	8.001	7.470	2.022	13.411	15.484
20	0.099	-0.072	5.859	5.860	-0.474	-0.559	13.572	13.592
21	1.898	-4.853	0.132	5.212	61.505	0.124	-4.850	61.696
22	0.243	0.150	3.688	3.699	0.483	-0.940	4.293	4.421
23	7.633	-3.004	1.919	8.424	-4.059	34.214	-32.307	47.232
24	0.244	-1.230	0.605	1.393	3.911	-2.674	0.515	4.765
25	1.707	0.791	18.815	18.909	1.102	-1.384	3.734	4.132
26	-8.400	-5.787	7.189	12.480	-10.318	8.983	1.801	13.799
27	0.112	-0.005	1.265	1.270	-0.039	-0.140	-0.253	0.292
28	-0.104	0.416	4.000	4.023	1.710	0.229	-2.667	3.176
29	-9.818	15.087	1.364	18.052	18.391	16.740	-0.372	24.872
30	-11.737	-2.169	13.647	18.130	25.692	-9.213	30.012	40.567