

## Движение точки в плоскости

Точка движется по закону  $x = x(t), y = y(t)$ . Для момента времени  $t = t_1$  найти скорость, ускорение точки и радиус кривизны траектории ( $x$  и  $y$  даны в см,  $t_1$  — в с).

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<b>Вариант 1</b> $x = 7e^{2t} + 8,$ $y = e^{4t}/4,$ $t_1 = 0.7.$	<b>Вариант 2</b> $x = 4(5t - \sin(5t)),$ $y = 4(1 - \cos(5t)),$ $t_1 = 7\pi/30.$
<b>Вариант 3</b> $x = 18t/(1 + t^3),$ $y = 18t^2/(1 + t^3),$ $t_1 = 0.3.$	<b>Вариант 4</b> $x = 3(2t - \sin(2t)),$ $y = 3(1 - \cos(2t)),$ $t_1 = \pi/3.$
<b>Вариант 5</b> $x = 3 \sin(11t),$ $y = \frac{3}{1 + \sin^2(11t)},$ $t_1 = 5\pi/21.$	<b>Вариант 6</b> $x = \cos(2t)(5 + 4 \cos(2t)),$ $y = \sin(2t)(5 + 4 \cos(2t)),$ $t_1 = 2\pi/3.$
<b>Вариант 7</b> $x = 11 \sin(5t),$ $y = -1.1(9 + \cos^2(5t)) \sin(5t),$ $t_1 = 13\pi/30.$	<b>Вариант 8</b> $x = \frac{1}{7}(90/(t^4 + 1) + 1),$ $y = t^4,$ $t_1 = 1.1.$
<b>Вариант 9</b> $x = \frac{1}{3}(210/(t^3 + 1) + 1),$ $y = t^3,$ $t_1 = 1.7.$	<b>Вариант 10</b> $x = t,$ $y = 6(e^{t/12} + e^{-t/12}),$ $t_1 = 10.$
<b>Вариант 11</b> $x = 22/(t + 2),$ $y = (60 - 80t)/(t + 2)^3,$ $t_1 = 0.8.$	<b>Вариант 12</b> $x = 6(3t - \sin(3t)),$ $y = 6(1 - \cos(3t)),$ $t_1 = 13\pi/18.$
<b>Вариант 13</b> $x = 6 \cos(2t)(1 + \cos(2t)),$ $y = 6 \sin(2t)(1 + \cos(2t)),$ $t_1 = \pi/12.$	<b>Вариант 14</b> $x = 14e^{t/14},$ $y = 14e^{t/14}(0.1e^{t/7} - 1),$ $t_1 = 2.$
<b>Вариант 15</b> $x = \cos(5t)(7 + 6 \cos(5t)),$ $y = \sin(5t)(7 + 6 \cos(5t)),$ $t_1 = \pi/30.$	<b>Вариант 16</b> $x = \frac{1}{10} \left( \frac{82}{\sin(2t)+2} + 1 \right),$ $y = 10 \sin(2t),$ $t_1 = \pi/6.$
<b>Вариант 17</b> $x = 10e^{-2t},$ $y = 30\sqrt{1 - e^{-4t}},$ $t_1 = 0.01.$	<b>Вариант 18</b> $x = 6t^2/(1 + t^2),$ $y = 6t^3/(1 + t^2),$ $t_1 = 10.$

<p><b>Вариант 19</b></p> $x = 5e^{2t} + 6,$ $y = e^{4t}/5,$ $t_1 = 0.2.$	<p><b>Вариант 20</b></p> $x = \frac{5(t^2-1)}{1+t^2},$ $y = \frac{5(t^2-1)t}{1+t^2},$ $t_1 = 3.$
<p><b>Вариант 21</b></p> $x = \frac{1}{10}(1140/(t^4 + 1) + 1),$ $y = t^4,$ $t_1 = 1.6.$	<p><b>Вариант 22</b></p> $x = 6e^{2t} + 7,$ $y = e^{4t}/3,$ $t_1 = 0.9.$
<p><b>Вариант 23</b></p> $x = 6t^4,$ $y = 7\sqrt{1-t^8},$ $t_1 = 0.88.$	<p><b>Вариант 24</b></p> $x = 5 \cos(10t)(1 + \cos(10t)),$ $y = 5 \sin(10t)(1 + \cos(10t)),$ $t_1 = 13\pi/60.$
<p><b>Вариант 25</b></p> $x = 8 \sin(2t),$ $y = 9 + 3 \cos(4t),$ $t_1 = 7\pi/12.$	<p><b>Вариант 26</b></p> $x = 10 \sin(4t),$ $y = 19 \cos(4t) + 11,$ $t_1 = \pi/6.$
<p><b>Вариант 27</b></p> $x = 3e^{-2t},$ $y = 9\sqrt{1-e^{-4t}},$ $t_1 = 0.06.$	<p><b>Вариант 28</b></p> $x = 5 \sin(4t),$ $y = \frac{5}{1+\sin^2(4t)},$ $t_1 = 11\pi/36.$
<p><b>Вариант 29</b></p> $x = \frac{1}{5} \left( \frac{31}{\sin(5t)+2} + 1 \right),$ $y = 5 \sin(5t),$ $t_1 = 13\pi/30.$	<p><b>Вариант 30</b></p> $x = 7e^{2t} + 8,$ $y = e^{4t}/5,$ $t_1 = 0.6.$

Ответы

	$v_x$	$v_y$	$v$	$W_x$	$W_y$	$W$	$W_\tau$	$W_n$	$R$
	sm/s			sm/s <sup>2</sup>					sm
1	56.77	16.44	59.11	113.55	65.78	131.22	127.36	31.59	110.59
2	37.32	-10.00	38.64	-50.00	-86.60	100.00	-25.88	96.59	15.45
3	16.14	10.10	19.04	-17.70	26.98	32.27	-0.70	32.26	11.24
4	9.00	5.20	10.39	10.39	-6.00	12.00	6.00	10.39	10.39
5	-12.06	6.44	13.67	-337.91	204.41	394.92	394.36	21.02	8.89
6	1.73	-9.00	9.17	26.00	-10.39	28.00	15.12	23.57	3.56
7	47.63	-44.06	64.88	-137.50	189.06	233.78	-229.32	45.42	92.68
8	-11.27	5.32	12.47	17.97	14.52	23.10	-10.05	20.80	7.47
9	-17.36	8.67	19.40	30.48	10.20	32.14	-22.71	22.75	16.55
10	1.00	0.93	1.37	0.00	0.11	0.11	0.08	0.08	22.45
11	-2.81	-3.45	4.45	2.00	7.53	7.79	-7.11	3.20	6.18
12	2.41	9.00	9.32	27.00	46.77	54.00	52.16	13.98	6.21
13	-16.39	16.39	23.18	-44.78	-53.57	69.82	-6.21	69.55	7.73
14	1.15	-0.69	1.35	0.08	0.02	0.08	0.06	0.06	32.11
15	-43.48	45.31	62.80	-301.55	-347.31	459.95	-41.80	458.05	8.61
16	-1.00	10.00	10.05	4.15	-34.64	34.89	-34.88	0.69	145.70
17	-19.60	291.12	291.78	39.21	-15431.51	15431.56	-15399.28	997.67	85.34
18	0.01	6.06	6.06	-0.00	-0.01	0.01	-0.01	0.00	10605.96
19	14.92	1.78	15.02	29.84	7.12	30.67	30.47	3.54	63.84
20	0.60	5.80	5.83	-0.52	-0.36	0.63	-0.41	0.48	70.80
21	-32.74	16.38	36.61	80.63	30.72	86.28	-58.35	63.56	21.08
22	72.60	48.80	87.47	145.19	195.19	243.27	229.39	81.00	94.46
23	16.36	-14.30	21.72	55.76	-150.25	160.26	140.87	76.41	6.18
24	-68.30	68.30	96.59	-933.01	-1116.03	1454.66	-129.41	1448.89	6.44
25	-13.86	-10.39	17.32	16.00	-24.00	28.84	1.60	28.80	10.42
26	-20.00	-65.82	68.79	-138.56	152.00	205.68	-105.15	176.77	26.77
27	-5.32	30.65	31.11	10.64	-348.63	348.79	-345.31	49.15	19.70
28	-15.32	-9.86	18.22	51.42	41.07	65.81	-65.47	6.70	49.55
29	-4.30	21.65	22.07	27.28	-62.50	68.19	-66.61	14.60	33.38
30	46.48	8.82	47.31	92.96	35.27	99.43	97.91	17.33	129.17