

## Уравнение Лагранжа. Определение ускорения

Дано выражение кинетической энергии и обобщенной силы механической системы с одной степенью свободы. В некоторый момент известны значения обобщенной координаты  $\varphi$  и скорости  $\dot{\varphi}$ . Найти ускорение  $\ddot{\varphi}$ .

### Задача D32.1.

$$T = \frac{\dot{\varphi}^2}{2}(3 \sin(2\varphi) + 6 \sin^2 \varphi + 1)$$

$$Q = 55, \varphi = \pi/4, \dot{\varphi} = 4.$$

### Задача D32.2.

$$T = \frac{\dot{\varphi}^2}{2}(2 \sin(2\varphi) + 2 \sin^2 \varphi + 1)$$

$$Q = -23, \varphi = \pi/4, \dot{\varphi} = 1.$$

### Задача D32.3.

$$T = \frac{\dot{\varphi}^2}{2}(7 \sin(2\varphi) - 22 \sin^2 \varphi + 1)$$

$$Q = -167, \varphi = \pi/4, \dot{\varphi} = 4.$$

### Задача D32.4.

$$T = \frac{\dot{\varphi}^2}{2}(4 \operatorname{tg}^2 \varphi - 5)$$

$$Q = 2, \varphi = \pi/4, \dot{\varphi} = 1.$$

### Задача D32.5.

$$T = \frac{\dot{\varphi}^2}{2}(3 \operatorname{ctg} \varphi - 9)$$

$$Q = -123, \varphi = \pi/4, \dot{\varphi} = 7.$$

### Задача D32.6.

$$T = \frac{\dot{\varphi}^2}{2}(14 \cos^2 \varphi + 1)$$

$$Q = -196, \varphi = \pi/4, \dot{\varphi} = 6.$$

### Задача D32.7.

$$T = \frac{\dot{\varphi}^2}{2}(8 \sin^2(3\varphi) + 3)$$

$$Q = -13, \varphi = \pi/4, \dot{\varphi} = 2.$$

### Задача D32.8.

$$T = \frac{\dot{\varphi}^2}{2}(2 \cos(2\varphi) - 1)$$

$$Q = -79, \varphi = \pi/4, \dot{\varphi} = 6.$$

### Задача D32.9.

$$T = \frac{\dot{\varphi}^2}{2}(5 \operatorname{tg}^2 \varphi - 2)$$

$$Q = 363, \varphi = \pi/4, \dot{\varphi} = 6.$$

### Задача D32.10.

$$T = \frac{\dot{\varphi}^2}{2}(6 \sin^2(3\varphi) - 1)$$

$$Q = -219, \varphi = \pi/4, \dot{\varphi} = 5.$$

### Задача D32.11.

$$T = \frac{\dot{\varphi}^2}{2}(7 \operatorname{tg}^2 \varphi - 3)$$

$$Q = -6, \varphi = \pi/4, \dot{\varphi} = 1.$$

### Задача D32.12.

$$T = \frac{\dot{\varphi}^2}{2}(6 \sin^2 \varphi - 13)$$

$$Q = 67, \varphi = \pi/4, \dot{\varphi} = 3.$$

### Задача D32.13.

$$T = \frac{\dot{\varphi}^2}{2}(10 \sin^2 \varphi + 3)$$

$$Q = 93, \varphi = \pi/4, \dot{\varphi} = 3.$$

### Задача D32.14.

$$T = \frac{\dot{\varphi}^2}{2}(8 \sin^2 \varphi - 5)$$

$$Q = 5, \varphi = \pi/4, \dot{\varphi} = 2.$$

**Задача D32.15.**

1

$$T = \frac{\dot{\varphi}^2}{2}(2 \operatorname{ctg} \varphi + 7)$$

$$Q = 18, \varphi = \pi/4, \dot{\varphi} = 6.$$

**Задача D32.16.**

1

$$T = \frac{\dot{\varphi}^2}{2}(14 \sin^2(3\varphi) - 11)$$

$$Q = -116, \varphi = \pi/4, \dot{\varphi} = 2.$$

**Задача D32.17.**

1

$$T = \frac{\dot{\varphi}^2}{2}(8 \sin^2 \varphi - 1)$$

$$Q = 130, \varphi = \pi/4, \dot{\varphi} = 5.$$

**Задача D32.18.**

1

$$T = \frac{\dot{\varphi}^2}{2}(2 \operatorname{ctg} \varphi + 3)$$

$$Q = -27, \varphi = \pi/4, \dot{\varphi} = 4.$$

**Задача D32.19.**

1

$$T = \frac{\dot{\varphi}^2}{2}(7 \sin(2\varphi) - 22 \sin^2 \varphi + 1)$$

$$Q = -135, \varphi = \pi/4, \dot{\varphi} = 3.$$

**Задача D32.20.**

1

$$T = \frac{\dot{\varphi}^2}{2}(4 \operatorname{ctg} \varphi - 15)$$

$$Q = -80, \varphi = \pi/4, \dot{\varphi} = 3.$$

**Задача D32.21.**

1

$$T = \frac{\dot{\varphi}^2}{2}(14 \sin^2(3\varphi) + 7)$$

$$Q = 14, \varphi = \pi/4, \dot{\varphi} = 2.$$

**Задача D32.22.**

1

$$T = \frac{\dot{\varphi}^2}{2}(7 \operatorname{tg} \varphi - 5)$$

$$Q = 62, \varphi = \pi/4, \dot{\varphi} = 2.$$

**Задача D32.23.**

1

$$T = \frac{\dot{\varphi}^2}{2}(3 \sin(2\varphi) - 2 \cos^2(3\varphi))$$

$$Q = 6, \varphi = \pi/4, \dot{\varphi} = 2.$$

**Задача D32.24.**

1

$$T = \frac{\dot{\varphi}^2}{2}(4 \sin^2 \varphi - 9)$$

$$Q = 8, \varphi = \pi/4, \dot{\varphi} = 2.$$

**Задача D32.25.**

1

$$T = \frac{\dot{\varphi}^2}{2}(14 \sin^2 \varphi - 9)$$

$$Q = 10, \varphi = \pi/4, \dot{\varphi} = 2.$$

**Задача D32.26.**

1

$$T = \frac{\dot{\varphi}^2}{2}(14 \cos^2 \varphi - 4)$$

$$Q = 2, \varphi = \pi/4, \dot{\varphi} = 1.$$

**Задача D32.27.**

1

$$T = \frac{\dot{\varphi}^2}{2}(7 \operatorname{tg} \varphi - 9)$$

$$Q = 106, \varphi = \pi/4, \dot{\varphi} = 4.$$

**Задача D32.28.**

1

$$T = \frac{\dot{\varphi}^2}{2}(2 \operatorname{tg}^2 \varphi - 5)$$

$$Q = 82, \varphi = \pi/4, \dot{\varphi} = 4.$$

**Задача D32.29.**

1

$$T = \frac{\dot{\varphi}^2}{2}(10 \sin^2 \varphi + 5)$$

$$Q = 20, \varphi = \pi/4, \dot{\varphi} = 2.$$

**Задача D32.30.**

1

$$T = \frac{\dot{\varphi}^2}{2}(14 \cos^2 \varphi - 9)$$

$$Q = -260, \varphi = \pi/4, \dot{\varphi} = 6.$$

**D32 Ответы.****Уравнение Лагранжа. Определение ускорения**

27.05.2012

№	$\ddot{\varphi}$	Уравнение Лагранжа
1	1	$7\ddot{\varphi} + 3\dot{\varphi}^2 = Q$
2	-6	$4\ddot{\varphi} + \dot{\varphi}^2 = Q$
3	-3	$-3\ddot{\varphi} - 11\dot{\varphi}^2 = Q$
4	6	$\ddot{\varphi} + 8\dot{\varphi}^2 = Q$
5	-4	$-6\ddot{\varphi} - 3\dot{\varphi}^2 = Q$
6	7	$8\ddot{\varphi} - 7\dot{\varphi}^2 = Q$
7	5	$7\ddot{\varphi} - 12\dot{\varphi}^2 = Q$
8	7	$\ddot{\varphi} - 2\dot{\varphi}^2 = Q$
9	1	$3\ddot{\varphi} + 10\dot{\varphi}^2 = Q$
10	3	$2\ddot{\varphi} - 9\dot{\varphi}^2 = Q$
11	-5	$4\ddot{\varphi} + 14\dot{\varphi}^2 = Q$
12	-4	$-10\ddot{\varphi} + 3\dot{\varphi}^2 = Q$
13	6	$8\ddot{\varphi} + 5\dot{\varphi}^2 = Q$
14	11	$\ddot{\varphi} + 4\dot{\varphi}^2 = Q$
15	10	$9\ddot{\varphi} - 2\dot{\varphi}^2 = Q$
16	8	$-4\ddot{\varphi} - 21\dot{\varphi}^2 = Q$
17	10	$3\ddot{\varphi} + 4\dot{\varphi}^2 = Q$
18	1	$5\ddot{\varphi} - 2\dot{\varphi}^2 = Q$
19	12	$-3\ddot{\varphi} - 11\dot{\varphi}^2 = Q$
20	4	$-11\ddot{\varphi} - 4\dot{\varphi}^2 = Q$
21	7	$14\ddot{\varphi} - 21\dot{\varphi}^2 = Q$
22	17	$2\ddot{\varphi} + 7\dot{\varphi}^2 = Q$
23	9	$2\ddot{\varphi} - 3\dot{\varphi}^2 = Q$
24	0	$-7\ddot{\varphi} + 2\dot{\varphi}^2 = Q$
25	9	$-2\ddot{\varphi} + 7\dot{\varphi}^2 = Q$
26	3	$3\ddot{\varphi} - 7\dot{\varphi}^2 = Q$
27	3	$-2\ddot{\varphi} + 7\dot{\varphi}^2 = Q$
28	-6	$-3\ddot{\varphi} + 4\dot{\varphi}^2 = Q$
29	0	$10\ddot{\varphi} + 5\dot{\varphi}^2 = Q$
30	4	$-2\ddot{\varphi} - 7\dot{\varphi}^2 = Q$