```
> restart;
```

```
> r := t -> a*<sin(theta(t)),cos(theta(t))>;
```

$$r := t \mapsto a \cdot \langle \sin(\theta(t)), \cos(\theta(t)) \rangle \tag{1}$$

```
> sys_vec := m*diff(r(t),t,t) =~ < 0, m*g> - tau(t)*r(t)/a;
```

$$sys\_vec := \begin{bmatrix} m\left(a\left(\frac{d^2}{dt^2}\theta(t)\right)\cos(\theta(t)) - a\left(\frac{d}{dt}\theta(t)\right)^2 \sin(\theta(t))\right) = \\ -\tau(t)\sin(\theta(t)) \\ m\left(-a\left(\frac{d^2}{dt^2}\theta(t)\right)\sin(\theta(t)) - a\left(\frac{d}{dt}\theta(t)\right)^2 \cos(\theta(t))\right) = \\ mg - \tau(t)\cos(\theta(t)) \end{bmatrix} \tag{2}$$

```
> sys_set := convert(sys_vec, set);
```

$$sys\_set := \left\{ m\left(a\left(\frac{d^2}{dt^2}\theta(t)\right)\cos(\theta(t)) - a\left(\frac{d}{dt}\theta(t)\right)^2 \sin(\theta(t))\right) = -\tau(t)\sin(\theta(t)), \; m\left(-a\left(\frac{d^2}{dt^2}\theta(t)\right)\sin(\theta(t)) - a\left(\frac{d}{dt}\theta(t)\right)^2 \cos(\theta(t))\right) = mg - \tau(t)\cos(\theta(t)) \right\} \tag{3}$$

```
> solve(sys_set, \{diff(theta(t),t,t), tau(t)\}):
sys := simplify(%);
```

$$sys := \left\{ \frac{d^2}{dt^2}\theta(t) = -\frac{g\sin(\theta(t))}{a}, \tau(t) = m\left(\left(\frac{d}{dt}\theta(t)\right)^2 a + \cos(\theta(t))\, g\right) \right\} \tag{4}$$

```
> select(has, sys, tau(t))[];
```

$$\tau(t) = m\left(\left(\frac{d}{dt}\theta(t)\right)^2 a + \cos(\theta(t))\, g\right) \tag{5}$$

```
> select(has, sys, diff(theta(t),t,t))[];
```

$$\frac{d^2}{dt^2}\theta(t) = -\frac{g\sin(\theta(t))}{a} \tag{6}$$