I.

$$m\vec{a} = m\vec{g} + \vec{T}$$
$$\text{y: } 0 = mg - T$$
$$mg = T$$
$$\alpha = 0$$

II.

$$m\vec{a} = m\vec{g} + \vec{T}$$
$$\text{x: } ma_x = T \sin\alpha$$
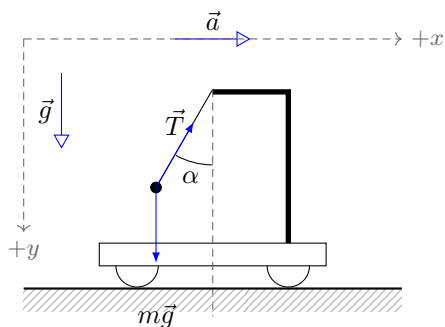$$\text{y: } 0 = mg - T \cos\alpha$$
$$\text{tg}\,\alpha = \frac{ma}{mg}$$
$$\alpha = \text{arctg}\,\frac{a}{g}$$
$$T = \frac{ma_x}{\sin\alpha} =$$
$$= \frac{ma_x}{a_x}\sqrt{a^2 + g^2} = m\sqrt{a^2 + g^2}$$

III.

M - масса системы

$$M\vec{a} = M\vec{g}$$
$$\text{x: } a_x = g \sin\phi$$
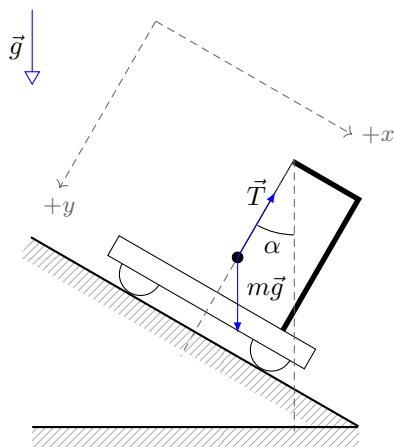$$m\vec{a} = m\vec{g} + \vec{T}$$
$$\text{x: } ma_x = mg \sin\phi + T_x$$
$$\text{y: } 0 = mg \cos\phi - T_y$$
$$\Downarrow$$
$$T_x = 0 \Rightarrow T = T_y = mg \cos\phi$$
$$\alpha = -\phi$$

IV.

$$m\vec{b} = m\vec{g} + \vec{T}$$

x: $mb = -mg\sin\phi + T\sin(\alpha + \phi)$

y: $0 = -mg\cos\phi + T\cos(\alpha + \phi)$

$$T = mg\frac{\cos\phi}{\cos(\alpha + \phi)}$$

$$mb = -mg\sin\phi + mg\cos\phi\,\mathrm{tg}(\alpha + \phi)$$

$$\frac{b}{g\cos\phi} + \mathrm{tg}\,\phi = \mathrm{tg}(\alpha + \phi) = \frac{\mathrm{tg}\,\alpha + \mathrm{tg}\,\phi}{1 - \mathrm{tg}\,\alpha\,\mathrm{tg}\,\phi}$$

$$\mathrm{tg}\,\alpha + \mathrm{tg}\,\phi = \frac{b}{g\cos\phi} - \frac{b\,\mathrm{tg}\,\alpha\,\mathrm{tg}\,\phi}{g\cos\phi} + \mathrm{tg}\,\phi - \mathrm{tg}^2\,\phi\,\mathrm{tg}\,\alpha$$

$$\mathrm{tg}\,\alpha\left(1 + \mathrm{tg}^2\,\phi + \frac{b\,\mathrm{tg}\,\phi}{g\cos\phi}\right) = \frac{b}{g\cos\phi}$$

$$\mathrm{tg}\,\alpha = \frac{\frac{b}{g}\cos\phi}{1 + \frac{b}{g}\sin\phi}, \qquad T = \sqrt{(mg)^2 + (mb)^2 - 2m^2bg\cos\left(\frac{\pi}{2} + \phi\right)} =$$

$$= m\sqrt{g^2 + b^2 + 2bg\sin\phi}$$

V.

$$m\vec{b} = m\vec{g} + \vec{T}$$

x: $mb = mg\sin\phi + T\sin\alpha$

y: $0 = -mg\cos\phi + T\cos\alpha$

$$T = mg\frac{\cos\phi}{\cos\alpha}$$

$$mb = mg\sin\phi + mg\cos\phi\,\mathrm{tg}\,\alpha$$

$$\frac{b}{g\cos\phi} - \mathrm{tg}\,\phi = \mathrm{tg}\,\alpha = \frac{b - g\sin\phi}{g\cos\phi}$$

$$\mathrm{tg}(\alpha + \phi) = \frac{\mathrm{tg}\,\phi + \frac{b}{g\cos\phi} - \mathrm{tg}\,\phi}{1 - \mathrm{tg}\,\phi\frac{b}{g\cos\phi} + \mathrm{tg}^2\,\phi} =$$

$$= \frac{\frac{b}{g}\cos\phi}{1 - \frac{b}{g}\sin\phi},$$

$$T = \sqrt{(mg)^2 + (mb)^2 - 2m^2bg\cos\left(\frac{\pi}{2} - \phi\right)} = m\sqrt{g^2 + b^2 - 2bg\sin\phi}$$