

Newton's Laws III-1

Mass suspended inside accelerating van (1):

$$F_x = m a, \quad F_y = m g, \quad \tan(\theta) = \frac{F_x}{F_y}, \quad F = \sqrt{F_x^2 + F_y^2}.$$

Boxes (2):

$$F = m g \sin(\theta).$$

Inclined plane (3):

$$\sin(\theta) = \frac{a}{g}.$$

Pulley (4).

Acceleration:

$$F = |m_2 - m_1| g, \quad a = \frac{F}{M}.$$

Tension:

$$T = \text{mass?} (a + g).$$

Newton's Laws III-2

Circular motion (5).

Maximum speed:

$$F_{\max} = M \frac{v_{\max}^2}{R}.$$

Tension on top:

$$T = M(a - g), \quad a = ?.$$

Conical pendulum (6).

Complete revolution:

$$a_x = \frac{v^2}{R}, \quad \tan(\theta) = \frac{a_x}{g}, \quad T = \frac{2\pi R}{v}.$$

Tension:

$$T = \sqrt{T_x^2 + T_y^2}.$$

Circular motion (7): Pail of water.

$$g = \frac{v^2}{R}.$$