MECH230 - Fall 2024
# Recommended Problems - Set 02

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The problems are taken from J. L. Meriam, L. G. Kraige, and J. N. Bolton (MKB), Engineering Mechanics: Dynamics, Ninth Edition, Wiley, New York, 2018.

1. [MKB 2/75] Take $\mathbf{E}_x$ to point along the incline and $\mathbf{E}_y$ to point perpendicular to $\mathbf{E}_x$ upwards. Follow the 4 steps. Take your origin to be at A. Projecting the balance of linear momentum along $\mathbf{E}_x$ and $\mathbf{E}_y$ should yield respectively

$$\ddot{x} = -g\sin(\alpha), \qquad \ddot{y} = -g\cos(\alpha).$$

As a check on your answer for $\alpha = 0$, the maximum range occurs when $\theta = 45°$.

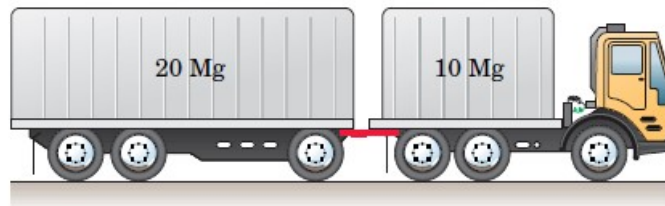▶2/75 A projectile is launched with speed v_0 from point A. Determine the launch angle θ which results in the maximum range R up the incline of angle α (where $0 \le \alpha \le 90°$). Evaluate your results for $\alpha = 0$, 30°, and 45°.
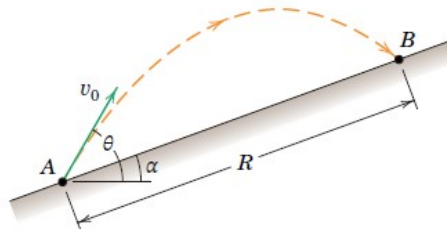
PROBLEM 2/75

2. [MKB 3/004] Take $\mathbf{E}_x$ and $\mathbf{E}_y$ to point horizontally to the right and vertically upwards respectively. Consider the system of the whole truck. Use the 4 steps to find the truck's acceleration. Then, consider either the front trailer or the back trailer. Use the 4 steps again to determine the tension in the horizontal drawbar.

3/4 The 10-Mg truck hauls the 20-Mg trailer. If the unit starts from rest on a level road with a tractive force of 20 kN between the driving wheels of the truck and the road, compute the tension T in the horizontal drawbar and the acceleration a of the rig.

PROBLEM 3/4