**Instructions:**

- Read the questions carefully. Detail all steps of your solution and include free-body diagrams. Writing only the equations and their solutions is not enough for full points.
- Make sure your answers include units.

Exercise 1

The snowmobile is traveling at 10 m/s when it leaves the embankment at A. Determine the time of flight from A to B and the range R of the trajectory. (9 pts)
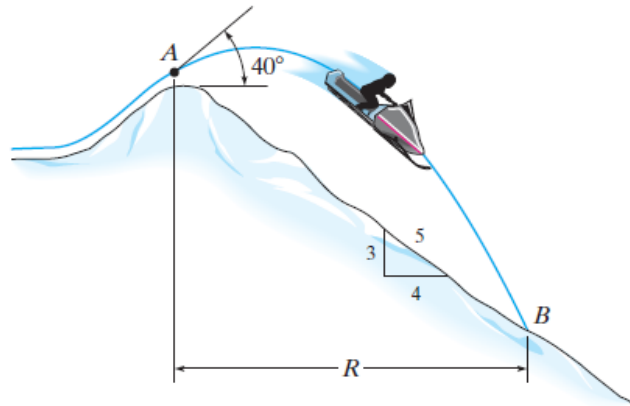
Exercise 2

The trailer with its load has a mass of 150 kg and a centre of mass at G. If it is subjected to a horizontal force of $P = 600$ N, determine the trailer's acceleration and the normal force on the pair of wheels at A and at B. The wheels are free to roll and have negligible mass. (9 pts)
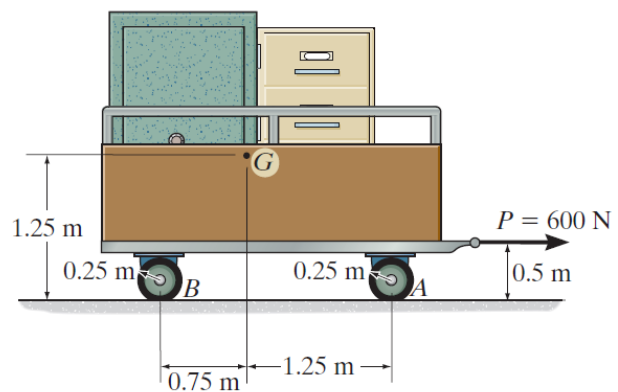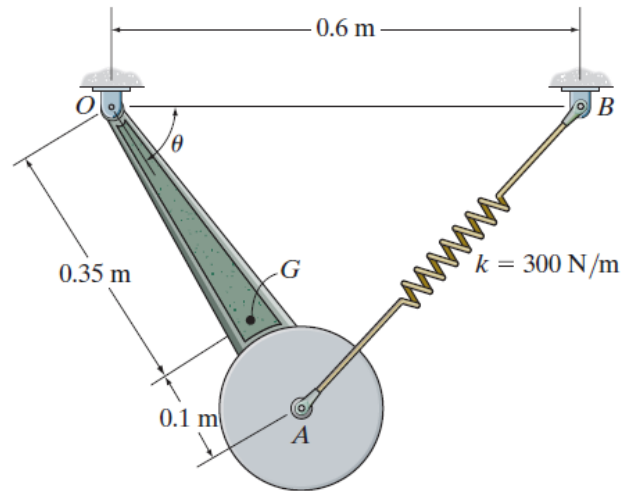
Exercise 3

A cord is wrapped around the outer surface of the 8 kg disk. If a force of $F = (\frac{1}{4} \cdot \theta^2)$, where θ is in radians and F in Newtons, is applied to the cord, determine the disk's angular velocity when it has turned 5 revolutions. The disk has an initial angular velocity of $\omega_0 = 1$ rad/s. (9 pts)
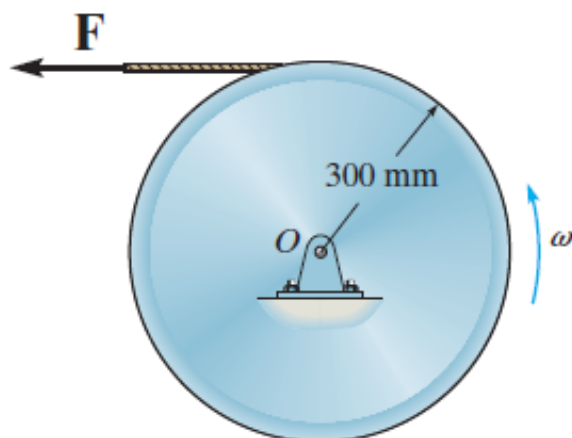
Exercise 4

The 30 kg pendulum has its centre of mass at point G and a radius of gyration about point G of $k_G = 300$ mm. If it is released from rest when $\theta = 0°$, determine its angular velocity at the instant $\theta = 90°$. Spring AB has a stiffness $k = 300$ N/m and is unstretched when $\theta = 0°$. (9 pts)

Exercise 5

The link AB has an angular velocity of 3 rad/s. Determine the velocity of block C and the angular velocity of link BC at the instant when $\theta = 45°$. (9 pts)