Impulse-Momentum for Particle Systems

Lecture 29

ME 231: Dynamics
Each of five connected particles has a **mass** of **0.6 kg**, the **velocity** of **$G$** is **$3i+4j$**, and the **angular momentum** of the system **about $G$** is **1.2k kg·m²/s**.

Determine the **angular momentum** $H_o$ of the system **about $O$**.
Outline for Today

- Question of the day
- Linear impulse and momentum problems (5.1 & 5.2)
- Angular impulse and momentum problems (5.3)
- System impulse-momentum problems (8.2)
- Answer your questions!
The basket and occupants have a combined mass of 320 kg and approach the netting at a speed of 28 m/s. The netting is connected to 20 m of chain with a mass of 18 kg/m and the coefficient of kinetic friction between the chain and ground is 0.70.

Determine the initial velocity $v$ of the chain when the cage engages the net and find the time $t$ to bring the cage to a stop.
The **80-lb boy** takes a running jump with a **velocity** of **16 ft/s** onto **10-lb skateboard** and **impact** lasts **0.05 s**.

Determine the **final speed** $v$ along the horizontal surface and the total **normal force** $N$ exerted by the surface on the skateboard during impact.
Using only the angular impulse-momentum principle, determine the expression for $\dot{\theta}$ in terms of $\theta$ and the velocity $v$ of the pendulum at $\theta = 90^\circ$. 
Angular Impulse and Momentum: Exercise 2

The projectile of mass $m$ is launched with speed $v_0$ at the angle $\theta$.

Determine the magnitude $H_0$ of the angular momentum about the launch point $O$ at (a) the instant of launch and (b) the instant of impact.
System Impulse-Momentum: Exercise 1

Determine the time $t$ required to bring the centrifuge to an angular velocity $\omega$ from rest under a constant torque $M$ applied to the shaft.
Two projectiles, each weighing 20 lb, are fired simultaneously with identical velocities \( v_r = 800 \text{ ft/s} \) relative to the cart weighing 2000 lb and moving opposite to the firing with an initial velocity \( v_1 = 4 \text{ ft/s} \).

Determine the velocity \( v_2 \) of the cart after the projectiles have been fired.
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For Next Time...

- Continue Homework #10 due on Thursday (11/8)
- Read Chapter 8, Sections 8.2 & 8.3