Collisions

Elastic Collisions Collisions in which objects collide and bounce off of each other, kinetic energy and momentum are conserved

Inelastic Collisions Collisions in which objects collide and don't bounce of each other such that momentum is conserved but kinetic energy is **not** conserved

in perfect collisions we can sub into our momentum and kinetic energy conservation formula then solve a system of equations

$$\vec{p_i} = \vec{p_f}$$
$$E_{k\,i} = E_{k\,f}$$

in inelastic collisions objects stick together so we only have the conservation of momentum equation to work with, but it's easier

$$m_1\vec{v_1}_i + m_2\vec{v_2}_i = m_t\vec{v_f}$$

ballistics pendulums are used to determine the speed of a projectile by knowing the height of a projectile in a pendulum, GPE $\rightarrow$ Ke then solving for final velocity of the system, then subbing into the equation of inelastic collisions outlined above

2D collisions

Not much of a note here but a couple tips can be provided

the law of conservation of momentum can be used in these situations, although often the momentum has to be broken into it's components.

$$P_i = P_f$$
$$m_1v_{1i} + m_2v_{2i} = m_1v_{1\,f} + m_2v_{2\,f}$$
$$4kg(5.0m/s) + 1kg(0m/s) = 4kg(3.0m/s[right20^oup] + m_2v_{2\,f}$$
$$20kgm/s = 12kgm/s[right20^oup] + m_2v_{2\,f}$$

calculate for right component

$$20kgm/s[right] = cos20^o12kgm/s + p_{2\,f}[right]$$
$$8.72kgm/s = p_{2\,f}[right]$$

calculate fro up component

$$0kgm/s = \sin 20^o 12kgm/s + p_{2f}[up]$$
$$-4.1kgm/s = p_{2f}[up]$$

momentum magnitude

$$\sqrt{p_{2f}[right]^2 + p_{2f}[up]^2}$$

direction =

$$\theta = tan^{-1}(\frac{p_{2f}[right]}{p_{2f}[up]})$$