Physics 2A Study Guide (non-calculus)

Kinematics formulas:
$\Delta v = a\Delta t$
$\Delta x = v_i \Delta t + 0.5a\Delta t^2$
$\Delta(v)^2 = 2a\Delta x$

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Tension = $(mv^2)/g$
Centripetal = $(mv^2)/r$

Friction = M_kN, usually $M_k(mg)$
Work done by friction = $M_kN\Delta x$

Springs:
Force = -kx
PE = $-0.5k\Delta x^2$

Energy:
Kinetic = $0.5mv^2$
Potential = mgh
V_f = sqrt(2gh), if no other sources involved.

Collisions:
inelastic – momentum is conserved, kinetic energy is not (crash and bounce)
completely inelastic – stick together (car crash)
elastic – kinetic energy is conserved (billiards balls)

For a linear crash (trains into each other) which is inelastic, combined mass, m_1 crashes into m_2
$V_f = (m_1v_{1,i}+m_2v_{2,i}) / (m_1+m_2)$

for an intersection (at 90 degree angle), inelastic
$(m_2v_2) / (m_1v_1) = \tan(\theta)$
where θ is the final angle of the debris (two cars stuck together)
$m_1v_1 = (m_1 + m_2) V_f\cos(\theta)$ | for final x momentum

elastic 1D
$V_{1,f} = (m_1 – m_2) / (m_1 + m_2) * V_i$
$V_{1,f} = (2m_1) / (m_1 + m_2) * V_i$

Momentum:
$\Sigma F\Delta t = \Delta p = I = mv_f - mv_i = m\Delta v$

$F_{av} = \Delta p / \Delta t = I / \Delta t$

Pendulum:
after crash (something shot into pendulum)

$V_f = m / (M+m) * V_i$ V_i is the V of the shot object
$KE = 0.5mV_i^2 (m / (M+m))$ where m is small mass being shot
final height = $[m / (M+m)]^2 [V_i^2/(2g)]^2$

Atwoods Machine:
Two masses suspended from a pulley. They are at an equal height "h" above the ground. When they are let go, with what speed does the heavier mass (m_2) hit the floor?

V_f = sqrt([2gh * ($m_2 - m_1$)] / [$m_1 + m_2$])

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Rotational Kinematics
momentum = Iw = mv = p
kinetic = $0.5mv^2 = 0.5Iw^2$

Conversions:
x = angle in radians (θ) | distance = rΔθ
v = w (angular velocity) | tangental = rw
a = **alpha** | radial = ??

incomplete. Not going to finish it because my notes are wrong.