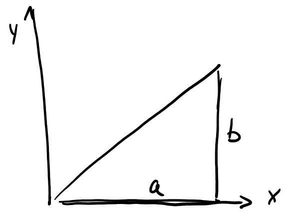
Homework #1

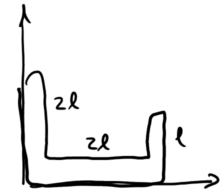
Wednesday, June 07, 2017 6:34 PM

1) Locate the center of mass and moments of inertia (by hand, use integration) for the following objects:



a) Thin triangular plate

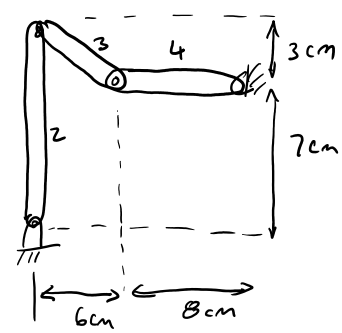
b) thin half-disk



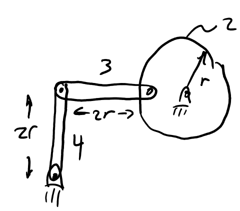
c) slender rod, 5l long.

2) Wikipedia lists the angular velocity of the earth as 7.2921e-5 rad/sec. Explain why the angular velocity of the earth is not 7.27e-5 as I might naively expect.

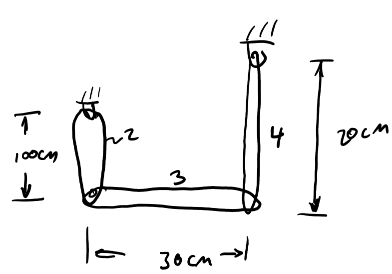
3) In the position shown, link 2 has a constant angular velocity of 3 rad/s CCW. Determine the angular acceleration of links 3 and 4.



4) At the instant shown, the disk rotates with constnat angular velocity w2 clockwise (CW). Find the angular accelerations of links 3 and 4.

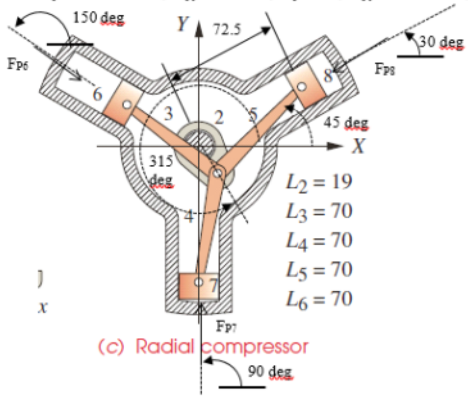


5) The uniform slender link 3 has a mass of 0.8 kg and is driven by crank 2. Link 4 has negligble mass. If the crank has angular velocity w2 = 2rad/sec and angular acceleration alpha2=4 rad/sec^2 in the position shown, calculate the force in link 4.



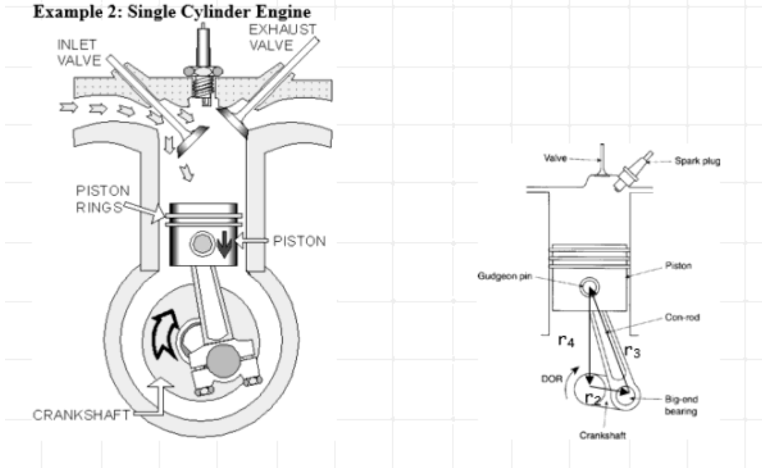
#6:

Force Analysis: Given the radial compressor shown in the figure below, solve for the torque generated in the crank (link 2) of the compressor. The compressor crank is rotating at a constant rate of 2500 RPM. The other position and velocity data is provided below, with all length units given in cm and velocities in cm/s. The pressure force on each piston is: $F_{p6} = 6kN$, $F_{p7} = 7kN$, $F_{p8} = 8kN$. Please show all work.
$V_{px6} = -1.408e3$, $V_{py6}=.813e3$; $V_{px7}= 0$, $V_{py7} = 2.829e3$; $V_{px8} =3.858e3$; $v_{py8} = 2.228e3$;



#7 Construct the equations for the forces at the input and in the pin joints in the Single cylinder engine. Write the equations in terms of the link lengths, angles, and Angular velocity and accelerations.

Example 2: Single Cylinder Engine



Complete a force analysis of the single cylinder engine via the Matrix Method