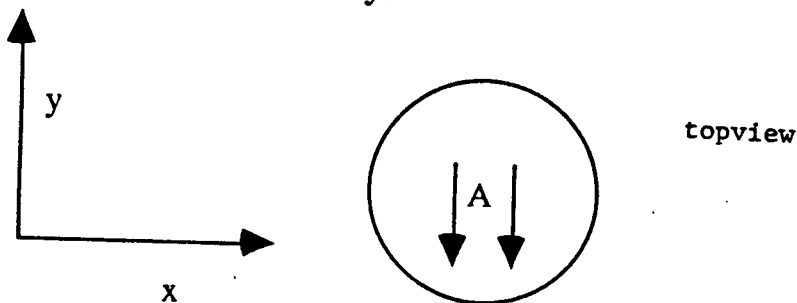


The swing pictured above is free to pivot in all directions (left-right and front-back) at each circled joint. The bars are rigid, uniform, thin, with mass M and length L each.

- (a) How many normal modes of small oscillations does this swing have?
- (b) Indicate what each of the normal modes looks like by drawings showing snapshots of the velocity vectors of the two bottom pivots at some time when the velocities are non-zero as seen from above. Label the modes for use in part (c). One mode (A) is shown for you. No derivation or detailed calculation is necessary.



- (c) Write an equation of motion for small amplitudes of each mode. Find the oscillation frequency for each mode, in terms of L , M , g .
- (d) Repeat part (b) for the case when the bottom bar is much more massive than the side bars.