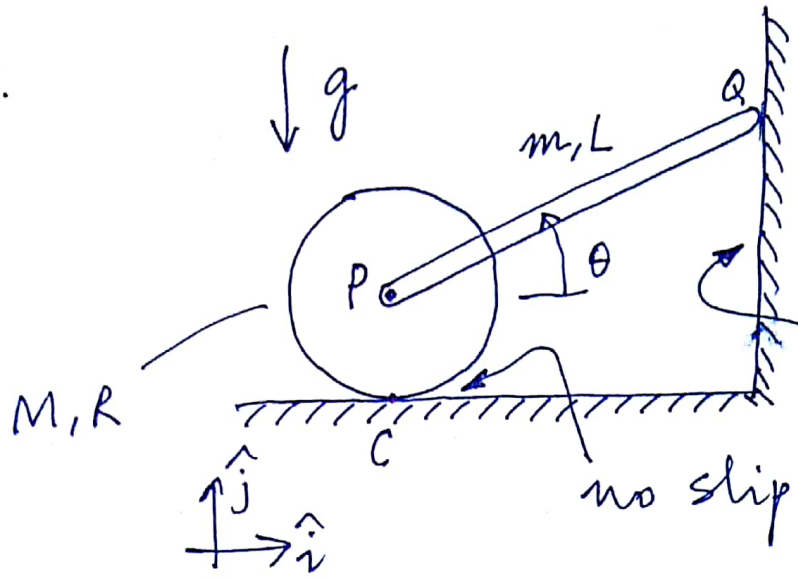
2 Dynamics Problems, 11/11/18

1.



- Uniform disk, M, R
- Uniform rod, m, L
- Released from rest
- P at centre of disk
- Frictionless hinge at P

Immediately after release, find the normal reaction force from the wall at Q.

How to set up equations?

- **FBD of Disk** Vector force at P, contact force at C, AMB about C (relate $\underline{a}_{disk}$ to x-component of force at P)
  - Kinematics: $\underline{a}_P$ is horizontal, to the left, $-\alpha_{disk} \cdot R\,\hat{i}$ } known in terms of x-component of force at P
- **FBD of Rod** Vector force at P, normal force at Q;
  - Kinematics: $\underline{a}_P \cdot \hat{j} = 0$, $\underline{a}_P \cdot \hat{i}$ as found above, $\underline{a}_Q \cdot \hat{i} = 0$ } 2 force components at P, 1 force component at Q
- If G is centre of mass of rod, then LMB gives $\underline{a}_G$ & AMB gives $\underline{\alpha}_{rod}$ in terms of forces at P & Q.

Do you agree? I find normal force at Q is $\frac{3}{2}\,\frac{mg\sin 2\theta\,(3M+m)}{4m+9M(1-\cos 2\theta)}$