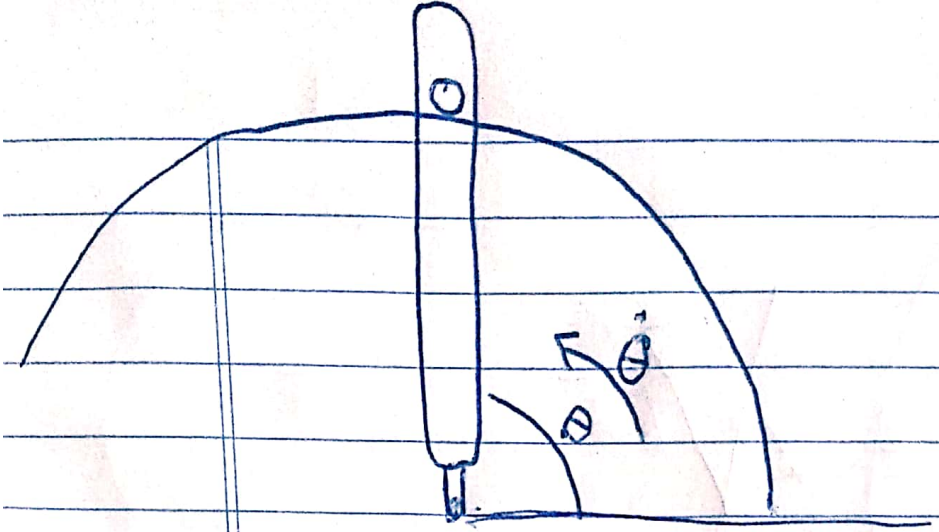


Date

$r = e^{k\theta}$

$\dot{\theta} = C$

given: μ, m, θ

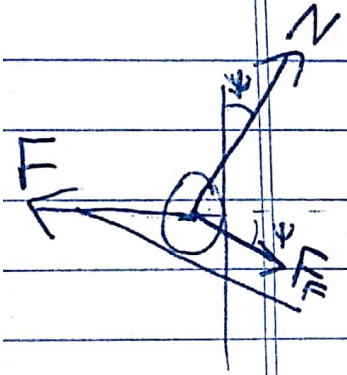
$\theta = \theta$ $\quad r = e^{k\theta}$

$\dot{\theta} = C$ $\quad \dot{r} = ke^{k\theta}\dot{\theta}$

$\ddot{\theta} = 0$ $\quad \ddot{r} = k^2 e^{k\theta}\dot{\theta}^2 + ke^{k\theta}\ddot{\theta}$ (→ 0)

$\frac{dr}{d\theta} = ke^{k\theta}$

$\tan\psi = \frac{r}{dr/d\theta} = \frac{1}{k}$



$\psi = \tan^{-1}(1/k)$

$a_\theta = 2\dot{r}\dot{\theta} = (F - \cos\psi F_F - \sin\psi N)/m$

$a_r = \ddot{r} - r\dot{\theta}^2 = (\cos\psi N - \sin\psi F_F)/m$

$F_F = \mu N$

3 eqns, 3 unknowns (F, F_F, N)

solve for F

$N = m(\ddot{r} - r\dot{\theta}^2)/(\cos\psi - \sin\psi \cdot \mu)$

$F = m(2\dot{r}\dot{\theta}) + (\sin\psi + \cos\psi \cdot \mu)N$

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