No.

Date

問題4

1) $x = r\cos\theta$, $y = r\sin\theta$

$$\frac{dx}{dt} = \frac{dr}{dt}\cos\theta - r\frac{d\theta}{dt}\sin\theta$$

$$= -v\cos\theta - rw\sin\theta$$

$$\frac{dy}{dt} = \frac{dr}{dt}\sin\theta + r\frac{d\theta}{dt}\cos\theta$$

$$= -v\sin\theta + rw\cos\theta$$

$$\frac{d^2x}{dt^2} = -\frac{dv}{dt}\cos\theta + v\frac{d\theta}{dt}\sin\theta - \frac{dr}{dt}w\sin\theta - r\frac{dw}{dt}\sin\theta - rw\frac{d\theta}{dt}\cos\theta$$

$$= vw\sin\theta + vw\sin\theta - rw^2\cos\theta = 2vw\sin\theta - rw^2\cos\theta$$

$$\frac{d^2y}{dt^2} = -\frac{dv}{dt}\sin\theta - v\frac{d\theta}{dt}\cos\theta + \frac{dr}{dt}w\cos\theta + r\frac{dw}{dt}\cos\theta - rw\frac{d\theta}{dt}\sin\theta$$

$$= -vw\cos\theta - vw\cos\theta - rw^2\sin\theta = -2vw\cos\theta - rw^2\sin\theta$$

$$\begin{pmatrix} \frac{d^2i}{dt^2} \\ \frac{d^2j}{dt^2} \end{pmatrix} = \begin{pmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{pmatrix} \begin{pmatrix} \frac{d^2x}{dt^2} \\ \frac{d^2y}{dt^2} \end{pmatrix}$$

$$= \begin{pmatrix} -rw^2 \\ -2vw \end{pmatrix}$$

2) i, j 軸方向の運動方程式より

$m\frac{d^2i}{dt} = F_i$, $m\frac{d^2j}{dt^2} = F_j$ $\therefore F_i = -mrw^2$, $F_j = -2mvw$

よって、大きさ $m|r|w^2$, 円盤の中心方向

$2m|v|w|$ 円盤の回る向きと反対の方向