5

$$\vec{r} = x\hat{x} + y\hat{y}$$

$$\dot{\vec{r}} = \dot{x}\hat{x} + \dot{y}\hat{y}$$

$$\vec{F} = -\frac{1}{2}\pi R^2 \rho c v^2 \hat{\dot{\vec{r}}}$$

$$F_{net} = -mg\hat{y} - \frac{\pi R^2 \rho c}{2}\left[\frac{\dot{x}\hat{x} + \dot{y}\hat{y}}{\sqrt{\dot{x}^2 + \dot{y}^2}}\right](\dot{x}^2 + \dot{y}^2)$$

$$\ddot{x} = \left(\frac{-\pi R^2 \rho c}{2m}\dot{x}\sqrt{\dot{x}^2 + \dot{y}^2}\right)\hat{x}$$

$$\ddot{y} = \left(-g - \frac{\pi R^2 \rho c}{2m}\dot{y}\sqrt{\dot{x}^2 + \dot{y}^2}\right)\hat{y}$$

$$\boxed{\frac{dx}{dt} = \dot{x}} \quad 1 \qquad \boxed{\frac{dy}{dt} = \dot{y}} \quad 2$$

$$\boxed{\frac{d\dot{x}}{dt} = \frac{-\pi R^2 \rho c}{2m}\dot{x}\sqrt{\dot{x}^2 + \dot{y}^2}} \quad 3$$

$$\boxed{\frac{d\dot{y}}{dt} = \frac{-\pi R^2 \rho c}{2m}\dot{y}\sqrt{\dot{x}^2 + \dot{y}^2} - g} \quad 4$$

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