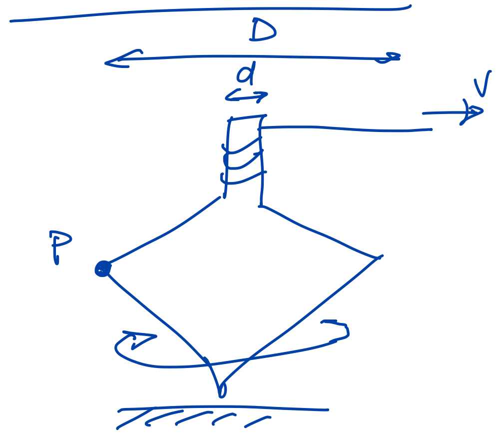
UBC-DYN-18-003



$|\vec{a}_p| = 150 cm/s^2$

$|\vec{v}| = 3.9 cm/s$

$d = 1.5 cm$

$r = 0.75 cm$

$D = 5 cm$

$R = 2.5 cm$

$\vec{R}_p = 2.5(-\hat{i})$

$\vec{\alpha} = \alpha\hat{k}$

$\omega = \frac{v}{r}$

$$\vec{a}_p = \cancel{\vec{a}_0}^{\,0} + \vec{\alpha} \times \vec{R}_p - \omega^2 \vec{R}_p$$

$$= \alpha\hat{k} \times 2.5(-\hat{i}) - \left(\frac{v}{r}\right)^2 2.5(-\hat{i})$$

$$= -2.5\alpha\hat{j} + 2.5\left(\frac{v}{r}\right)^2\hat{i}$$

$$|\vec{a}_p| = \sqrt{(2.5\alpha)^2 + \left(2.5\frac{v^2}{r^2}\right)^2} = 150 \ cm/s^2$$

$$(2.5\alpha)^2 + \left(2.5\frac{v^2}{r^2}\right)^2 = (150)^2$$

$$(2.5\alpha)^2 = (150)^2 - \left(2.5\frac{v^2}{r^2}\right)^2$$

$$2.5\alpha = \sqrt{150^2 - \left(2.5\frac{v^2}{r^2}\right)^2}$$

$$\alpha = \frac{1}{2.5}\sqrt{150^2 - \left(2.5\frac{v^2}{r^2}\right)^2} \quad ✓ \quad = 53.5615 \ rad/s^2$$

$$|\vec{a}_{string}| = a_t \text{ @ string}$$

$$= |\vec{\alpha} \times \vec{r}| = 53.5615 \times 0.75 = 40.1711 \ cm/s^2 \ ✓$$