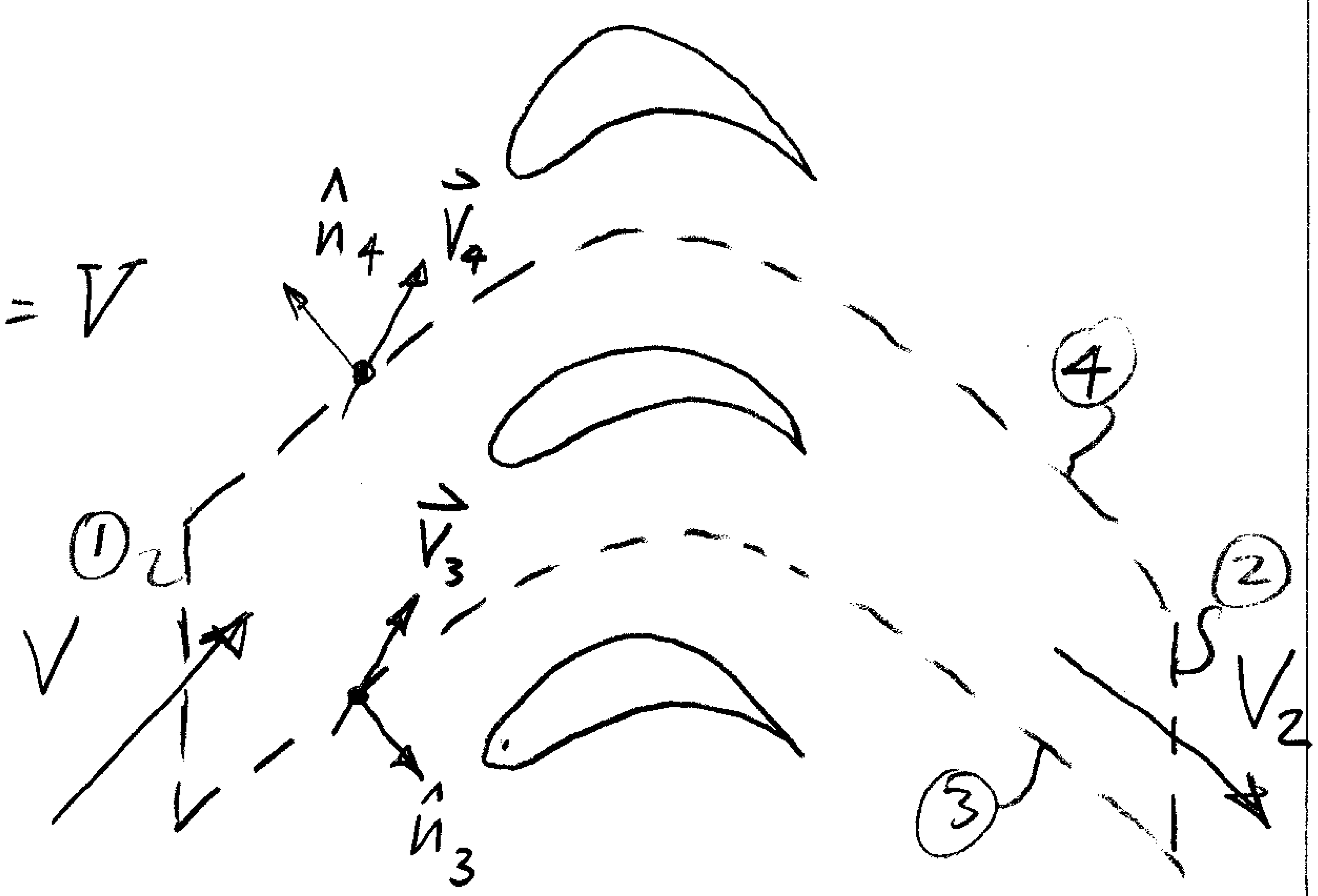
Control Volume:

By mass conservation, $V_2 = V$

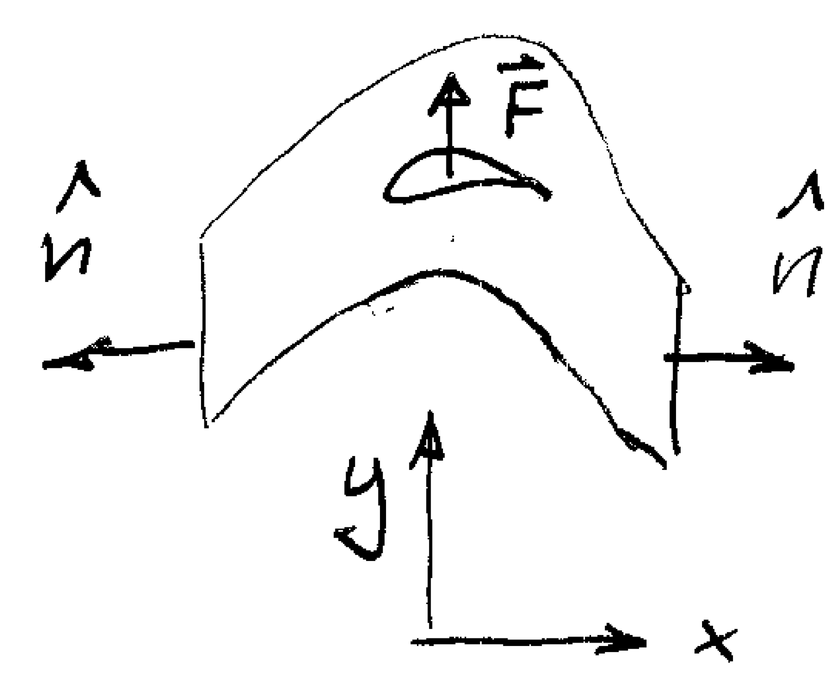


Because flow is periodic, $\vec{V}_3 = \vec{V}_4$, $p_3 = p_4$

And since $\hat{n}_4 = -\hat{n}_3$, then sides ③ and ④ will cancel in momentum integral.

$$\oiint_{1} (p\hat{n} + \rho \vec{V}\cdot\hat{n}\,\vec{V})\,dA + \oiint_{2} (p\hat{n} + \rho \vec{V}\cdot\hat{n}\,\vec{V})\,dA = -\vec{F}$$

By symmetry, $\oiint_{1} p\hat{n}\,dA + \oiint_{2} p\hat{n}\,dA = 0$



$$\oiint_{1} (\rho \vec{V}\cdot\hat{n}\,\vec{V})\,dA + \oiint \rho \vec{V}\cdot\hat{n}\,\vec{V}\,dA = -\vec{F}$$

$$-\rho V\frac{\sqrt{2}}{2}\cdot V\begin{bmatrix}\sqrt{2}/2\\ \sqrt{2}/2\end{bmatrix} h + \rho V\frac{\sqrt{2}}{2}\cdot V\begin{bmatrix}\sqrt{2}/2\\ -\sqrt{2}/2\end{bmatrix} = -\vec{F}$$

$$\boxed{\vec{F} = \begin{bmatrix}0\\ \rho V^2 h\end{bmatrix} \quad \text{Vertical Force}}$$