$$-\Phi_0 \frac{\partial}{\partial \varphi}(\Phi_1 a \sin\varphi) - \Phi_1 \frac{\partial}{\partial \varphi}(\Phi_0 a \sin\varphi) - A_1 \left[\Phi_0 + \frac{\partial}{\partial a}(a\Phi_0)\right] \sin\varphi = -a\Phi_0 f \sin\varphi \tag{1}$$