

$$= -\frac{\phi_B \ell}{16} + \frac{\phi_B \ell}{16} + \frac{\phi_B \ell}{4} - \frac{\phi_B \ell}{4} = 3\frac{\phi_B \ell}{16} + 5\frac{\phi_B \ell}{16}$$

$$z = \frac{\ell}{2} \rightarrow \sqrt{C} = \left(-3\frac{\phi_B}{\ell^2} + 3\frac{\phi_B}{\ell^2} + \frac{\phi_B}{48} \right) \frac{\ell^3}{2} + \left(\frac{\phi_B}{2} - \frac{\phi_B}{2} \right) \frac{\ell}{2} + \frac{\phi_B \ell}{4}$$

$$\sqrt{C_3} = \frac{\phi_B}{2} - \frac{\phi_B}{4} - \frac{\phi_B}{4} = \frac{\phi_B}{2} - \frac{3\phi_B}{4} = -\frac{\phi_B}{4}$$

$$\sqrt{C_1} = -3\frac{\phi_B}{\ell^2} + 3\frac{\phi_B}{\ell^2}$$

$$-\frac{3}{C_1 \ell^2} = \frac{\phi_B}{2} - \frac{\phi_B}{4}$$

$$z = \ell, \phi_B = \frac{\phi_B}{2} \rightarrow -\frac{3}{C_1 \ell^2} + \frac{3}{C_1 \ell^2} + \frac{\phi_B}{2} = \frac{\phi_B}{2}$$

$$C_3 = -\frac{3}{C_1 \ell^2} - \frac{\phi_B}{2}$$

$$z = \ell, \phi_B = 0 \rightarrow C_1 \ell^3 + C_3 \ell + \phi_B = 0$$

$$z = 0, \phi_B = 0 \rightarrow C_2 = 0$$

$$z = 0, \phi_B = \phi_B \rightarrow C_4 = \phi_B$$

$$V(z) = C_1 z^3 + C_2 z^2 + C_3 z + C_4$$

$$\frac{dV(z)}{dz} = C_1 z^2 + C_2 z + C_3$$

$$\frac{d^2 V(z)}{dz^2} = C_1 = C_1 z + C_2$$

