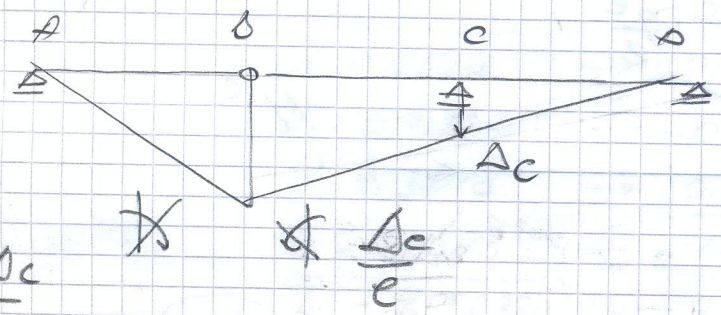
$$= \frac{1}{EI} q \left(\frac{-4\ell^4 + 3\ell^4 + 4\ell^4 + 6\ell^4 + 8\ell^4}{24\ell} \right) = \quad (2)$$

$$= \frac{17}{24} \frac{q\ell^3}{EI}$$

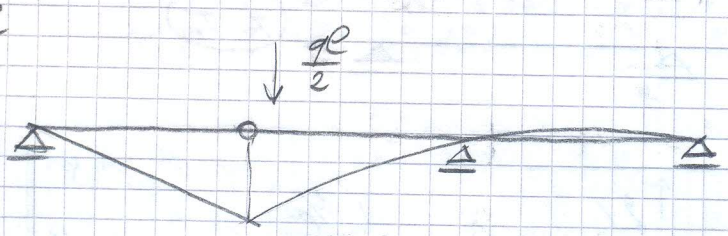
$$\boxed{\Delta\varphi = \frac{3q\ell^3}{24EI} + \frac{17}{24}\frac{q\ell^3}{EI} = \frac{20}{24}\frac{q\ell^3}{EI} = \frac{5}{6}\frac{q\ell^3}{EI}} > 0$$

$\Rightarrow \varphi^D > \varphi^S$

2.B)



$\frac{2\Delta_c}{\ell}$ $\quad$ $\frac{\Delta_c}{\ell}$



$$\nabla_B\left(\frac{q\ell}{2}\right) = \frac{q\ell^2}{2}\cdot\frac{\ell}{3EI}\cdot\ell + \frac{q\ell}{2}\frac{\ell^3}{3EI} = \frac{q\ell^4}{6EI} + \frac{q\ell^4}{6EI} = \frac{q\ell^4}{3EI}$$

$$\varphi_B^S\left(\frac{q\ell}{2}\right) = -\frac{q\ell^4}{3EI}\cdot\frac{1}{\ell} = -\frac{q\ell^3}{3EI}$$

$$\varphi_B^D\left(\frac{q\ell}{2}\right) = \frac{q\ell^2}{2}\frac{\ell}{3EI} + \frac{q\ell}{2}\frac{\ell^2}{2EI} = \frac{q\ell^3}{6EI} + \frac{q\ell^3}{4EI} = \frac{5}{12}\frac{q\ell^3}{EI}$$

$$\varphi_B^S(q) = \frac{q\ell^3}{24EI}$$

$$\varphi_B^S(\Delta_c) = -\frac{2\Delta_c}{\ell} = -\frac{q\ell^3}{12EI}$$

$$\varphi_B^D(\Delta_c) = \frac{\Delta_c}{\ell} = \frac{q\ell^3}{24EI}$$

$$\Delta\varphi = \varphi_B^D - \varphi_B^S = \frac{q\ell^3}{24E} + \frac{5}{12}\frac{q\ell^3}{EI} - \left(-\frac{q\ell^3}{3EI} + \frac{q\ell^3}{24EI} - \frac{\ell^3}{12EI}\right) =$$