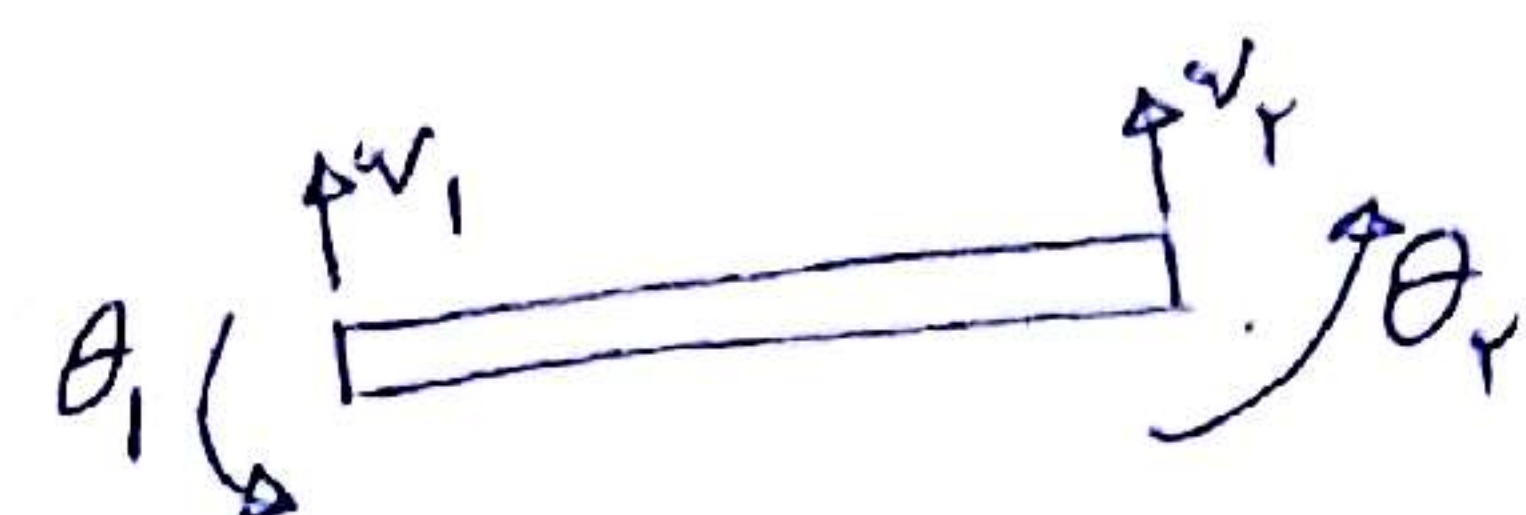
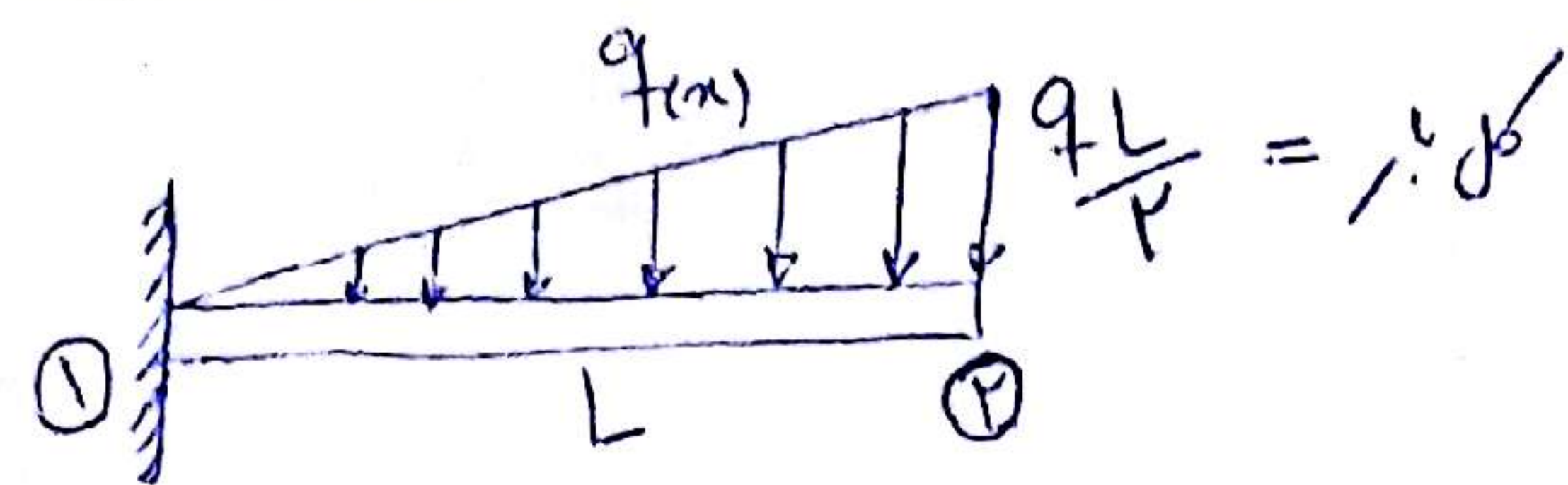


①

بدر

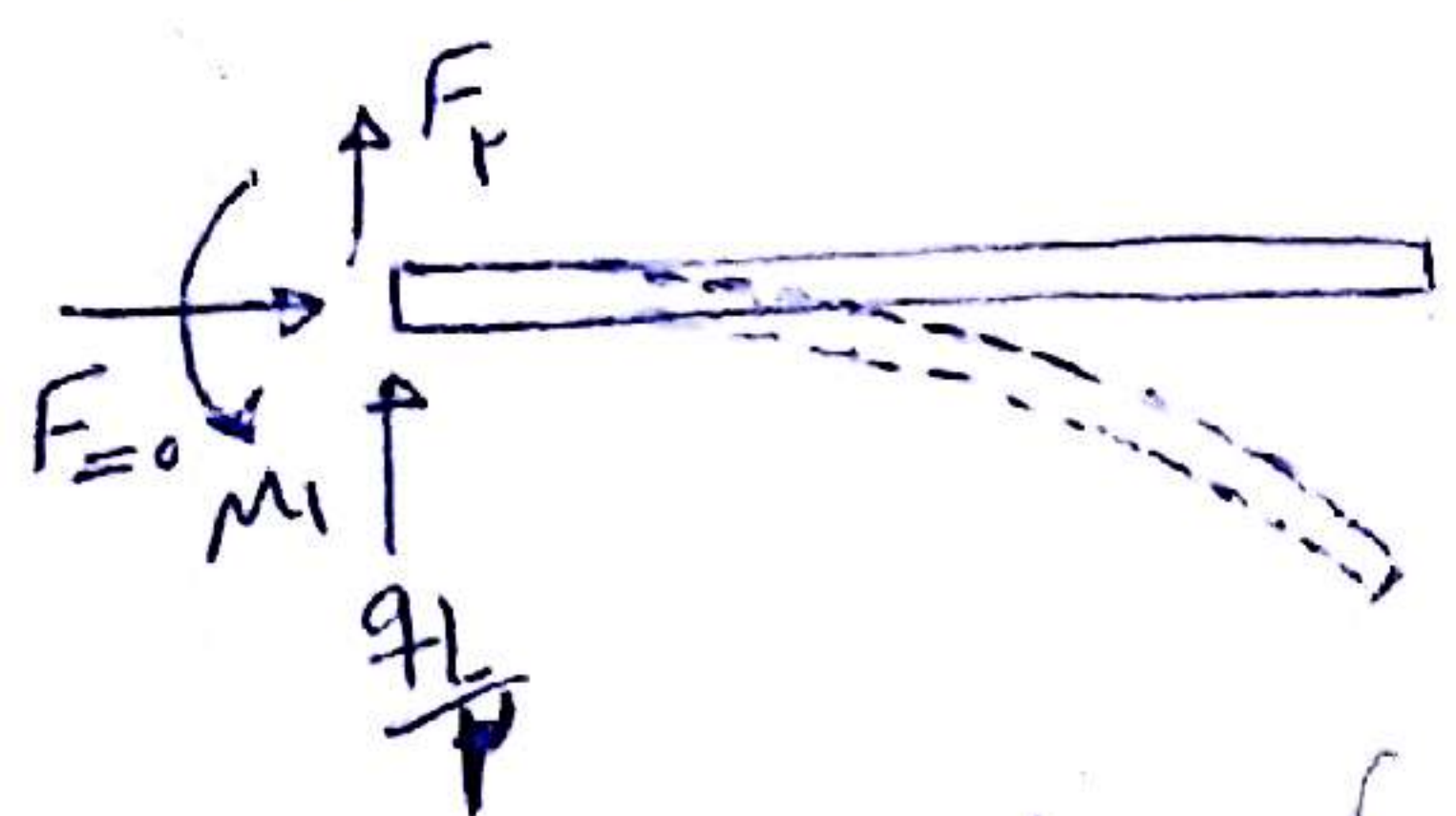
مسألة ١٥



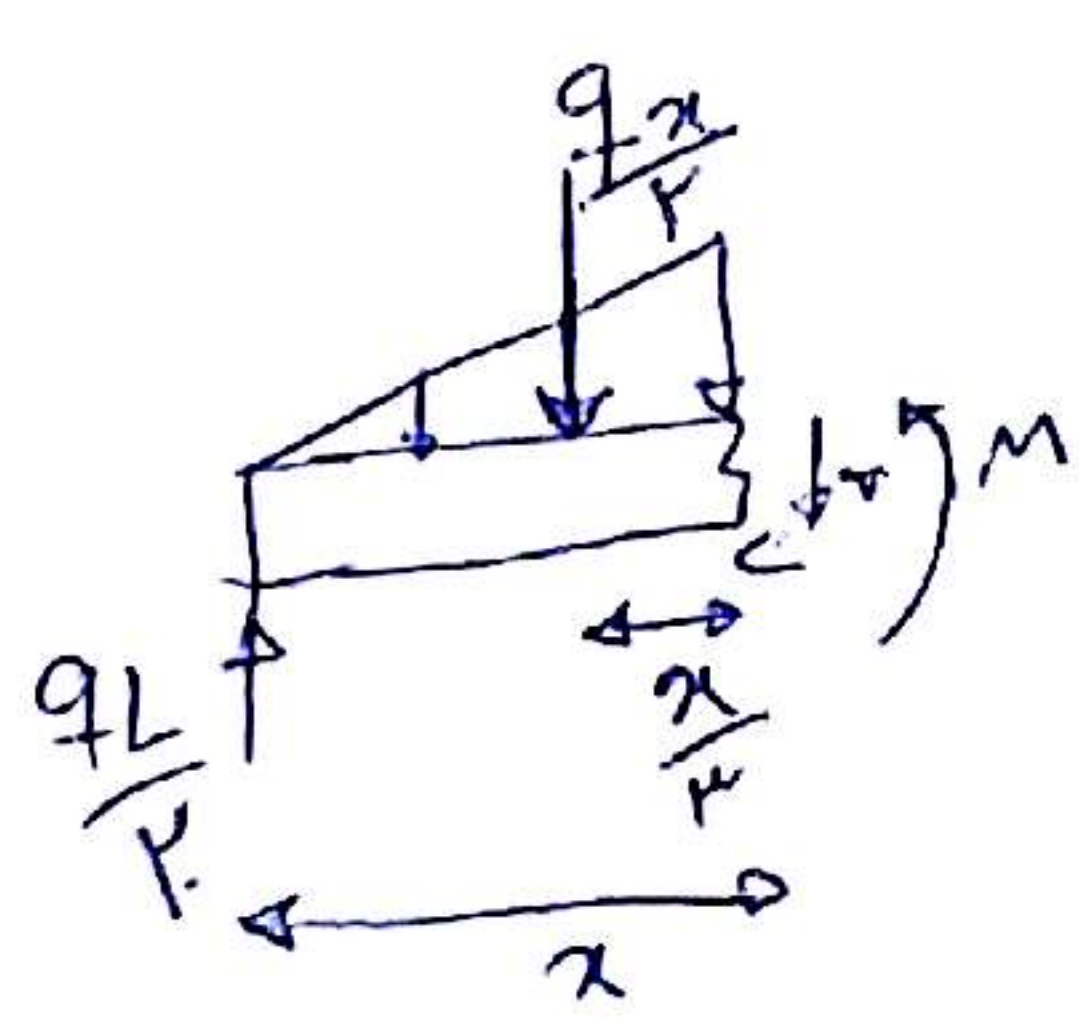
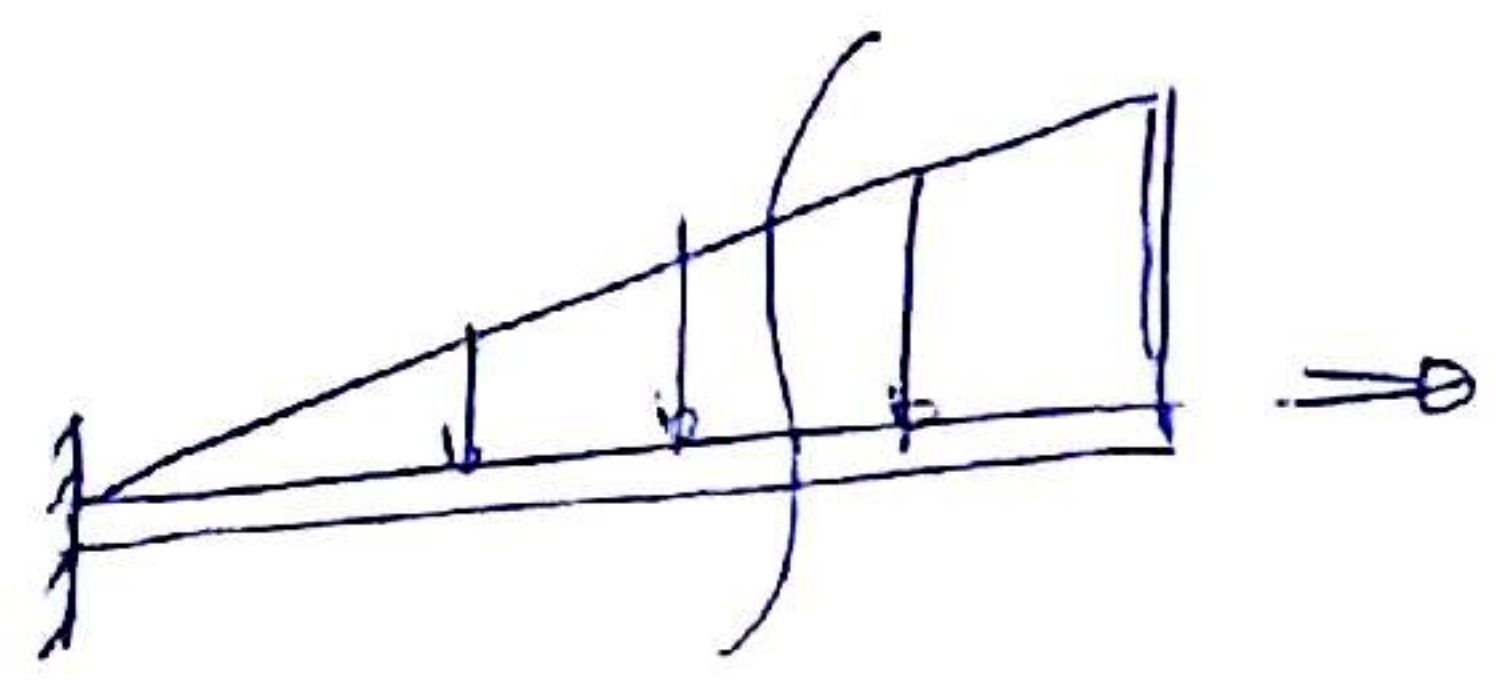
$$v_1 = \theta_1 = 0$$

$$\sum F_y = 0 \Rightarrow F_y = \frac{qL}{r}$$

$$\sum F_x = 0 \Rightarrow F_x = 0$$



$$\frac{EI}{L^3} \begin{bmatrix} 12 & 6L & -12 & 6L \\ 6L & 2L^2 & -6L & L^2 \\ -12 & -6L & 12 & -6L \\ 6L & L^2 & -6L & 2L^2 \end{bmatrix} \begin{bmatrix} v_1 \\ \theta_1 \\ v_2 \\ \theta_2 \end{bmatrix} = \begin{bmatrix} F_1 = \frac{qL}{r} \\ M_1 = 0 \\ F_2 = \frac{qL}{r} \\ M_2 = \frac{1}{r} qL^2 \end{bmatrix}$$



$$\sum M_c = 0 \Rightarrow \frac{qL}{r}(x) - \frac{qx}{r}\left(\frac{x}{r}\right) = M$$

$$\Rightarrow M = -\frac{1}{r} qx^2 + \frac{1}{r} qLx$$

$$@ x = 0 \Rightarrow M = 0$$

$$@ x = L \Rightarrow M = -\frac{1}{r} qL^2 + \frac{1}{r} qL^2 = \frac{1}{r} qL^2$$

$$\begin{cases} 12v_2 - 6L\theta_2 = \frac{qL}{r} \Rightarrow 12v_2 = \frac{qL}{r} + 6L\theta_2 \Rightarrow v_2 = \frac{qL}{12r} + \frac{L\theta_2}{2} \\ -6Lv_2 + 2L^2\theta_2 = \frac{1}{r} qL^2 \Rightarrow -6L\left(\frac{qL}{12r} + \frac{L\theta_2}{2}\right) + 2L^2\theta_2 = \frac{1}{r} qL^2 \end{cases}$$

$$\Rightarrow -\frac{qL^2}{2} - 3L^2\theta_2 + 2L^2\theta_2 = \frac{1}{r} qL^2 \Rightarrow \frac{1}{r} q + \frac{1}{1} q = +\theta_2 \Rightarrow \theta_2 = \frac{11}{12} \frac{q}{r}$$

$$\Rightarrow v_2 = \frac{qL}{12r} + \frac{L}{2} \left(\frac{11}{12} \frac{q}{r} \right) = \frac{qL}{12r} + \frac{11qL}{24r} = \frac{12qL}{24r} = \frac{qL}{2r}$$