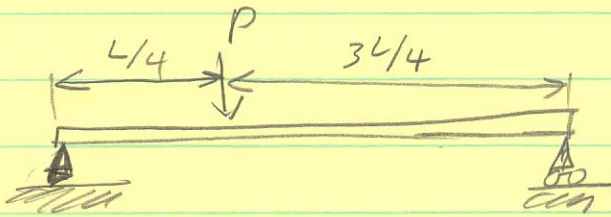


Example 9.03 (worked out using the 4th order method)

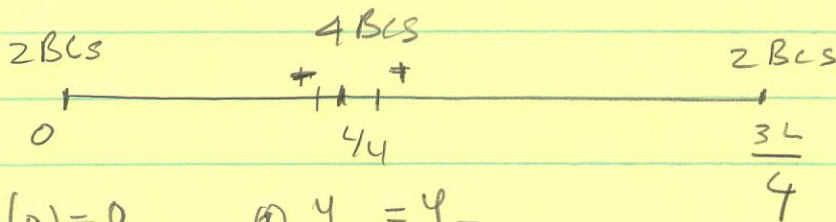


$$EI \frac{d^4 y}{dx^4} = -v(x) = 0 \quad 0 < x < L/4$$

$$= 0 \quad L/4 < x < L$$

$$y(x) = \frac{C_1}{6} x^3 + \frac{C_2}{2} x^2 + C_3 x + C_4 \quad 0 < x < \frac{L}{4}$$

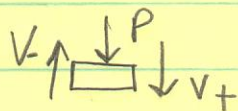
$$= \frac{D_1}{6} (x-L)^3 + \frac{D_2}{2} (x-L)^2 + \frac{D_3}{2} (x-L) + D_4 \quad \frac{L}{4} < x < L$$



① $y(0) = 0$
 ② $\frac{d^2 y}{dx^2} = 0$

③ $y_+ = y_-$
 ④ $\left. \frac{dy}{dx} \right|_+ = \left. \frac{dy}{dx} \right|_-$
 ⑤ $\left. \frac{d^2 y}{dx^2} \right|_+ = \left. \frac{d^2 y}{dx^2} \right|_-$

⑥ $y(L) = 0$
 ⑦ $\frac{d^2 y}{dx^2} = 0$



$$V_- - V_+ = P$$

$$\Rightarrow \textcircled{6} \left. \frac{d^3 y}{dx^3} \right|_- - \left. \frac{d^3 y}{dx^3} \right|_+ = \frac{P}{EI}$$

$$\text{BCs } \textcircled{1} \text{ and } \textcircled{2} \Rightarrow C_4 = C_2 = 0$$

$$\text{BCs } \textcircled{3} \text{ and } \textcircled{4} \Rightarrow D_4 = D_2 = 0$$

$$\textcircled{3} \quad \frac{C_1}{6} \left(\frac{L}{4}\right)^3 + C_3 \left(\frac{L}{4}\right) = \frac{D_1}{6} \left(\frac{-3L}{4}\right)^3 + D_3 \left(\frac{3L}{4}\right)$$

$$\textcircled{4} \quad \frac{C_1}{2} \left(\frac{L}{4}\right)^2 + C_3 = \frac{D_1}{2} \left(\frac{3L}{4}\right)^2 + D_3$$

$$\textcircled{5} \quad C_1 \left(\frac{L}{4}\right) = D_1 \left(-\frac{3L}{4}\right)$$

$$\textcircled{6} \quad C_1 - D_1 = \frac{P}{EI}$$

solve for $C_1, C_3, D_1, \frac{P}{3}$

```
In[11]= Soln = Solve[{{(C1/6) (L/4)^3 + C3 (L/4) = (D1/6) (-3L/4)^3 + D3 (-3L/4),  
(C1/2) (L/4)^2 + C3 = (D1/2) (-3L/4)^2 + D3,  
C1 (L/4) = D1 (-3L/4), C1 - D1 = P/EI}, {C1, C3, D1, D3}]
```

```
Out[11]= {{C3 -> -\frac{7L^2 P}{128 EI}, D3 -> \frac{5L^2 P}{128 EI}, C1 -> \frac{3P}{4 EI}, D1 -> -\frac{P}{4 EI}}}
```

```
In[13]= (C1/6) (L/4)^3 + C3 (L/4) /. Soln
```

```
Out[13]= {-\frac{3L^3 P}{256 EI}}
```

```
In[14]= (D1/6) (-3L/4)^3 + D3 (-3L/4) /. Soln
```

```
Out[14]= {-\frac{3L^3 P}{256 EI}}
```