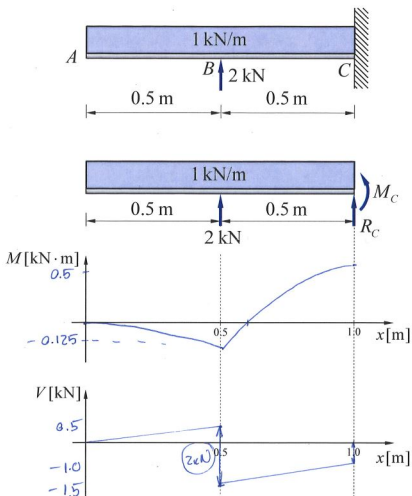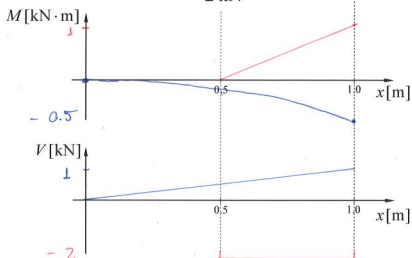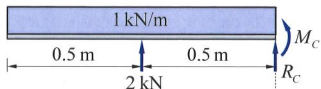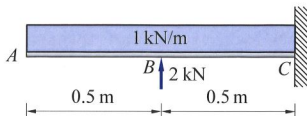<u>Example 2.6</u> – Plot the bending moment and shear force diagrams for the following cantilever beam:

Example 2.7 – Plot the bending moment and shear force diagrams for the following cantilever beam:

1 kN/m

A

B ↑ 2 kN

C

0.5 m   0.5 m

1 kN/m

0.5 m   0.5 m

M_C

2 kN

R_C

$M\,[\mathrm{kN \cdot m}]$

Case 1:

Case 2:

1

− 0.5

0,5   1,0 $x\,[\mathrm{m}]$

$V\,[\mathrm{kN}]$

Case 1

Case 2

1

0,5   1,0 $x\,[\mathrm{m}]$

− 2

Reactions:

$$\Sigma F_y = 0 \qquad \therefore \quad -\left(\frac{1 \, kN}{m}\right) \cdot (1m) + 2 \, kN + R_c = 0$$

$$\boxed{R_c = -1 \, kN}$$

Case 1:

$$\Sigma m_x^{ccw} = 0 \quad \therefore \qquad M_{(x)} + \left(\frac{1 \, kN}{m}\right)(x)\left(\frac{x}{2}\right) = 0$$

$$\boxed{M_{(x)} = -\frac{x^2}{2}}$$

$$x = 0 \quad \longrightarrow \quad M_{(x)} = 0$$

$$x = 1m \quad \longrightarrow \quad M_{(x)} = -\frac{1}{2} \, kN.m$$

Case 2:

$$M_{c,z} = 2 kN \cdot \frac{1}{2} m \qquad \boxed{M_{(x)_2} = 2 \cdot (x-0.5)}$$
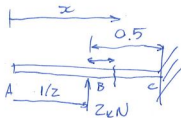
span B-C

$$\boxed{M_{c,z} = 1 kN m}$$

$$M_{(x)_1} = -\frac{x^2}{2} \qquad M_{(x)_2} =$$

$$M_{(x=0.5)} = -\frac{0.5^2}{2} = -\frac{1}{8} kN m$$

$$M_{(x=1)} = -\frac{1}{2} + 1 = +\frac{1}{2} kN \cdot m$$

Case 1   Case 2

$$M_{(x)_1} = -\frac{x^2}{2} \qquad M_{(x)_2} = 2 \cdot \left(x - \frac{1}{2}\right)$$

$$M_{(x)} = -\frac{x^2}{2} + 2\left(x - \frac{1}{2}\right)$$

span BC

$$-\frac{x^2}{2} + 2\left(x - \frac{1}{2}\right) = 0 \longrightarrow \text{find root} \longrightarrow \text{point where BMD crosses the } x \text{ axis.}$$