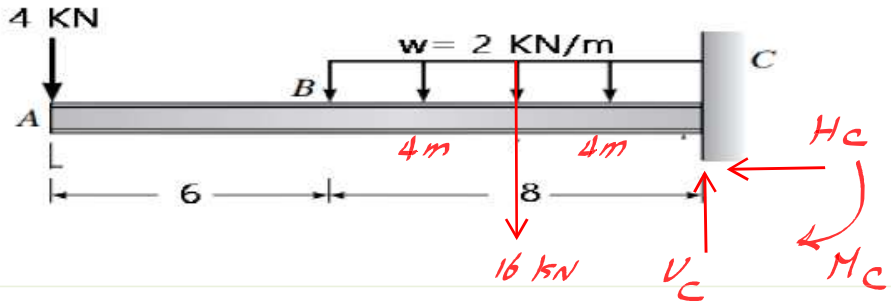

M R
Ahmed Mahdy
مدرس خصوصي
اونلاين
حضوري
يحصل الطالب علي
. مقاطع فيديوهات لشرح المقرر بشكل وافي
. ملخص للمادة Pdf للمذكرة والمراجعة
. محاضرات مباشرة علي برنامج زووم
لمناقشة الأجزاء الغير مفهومة
. تواصل مستمر مع معلم المادة
للتواصل
0567630097
0565657741
فيزياء
استاتيكا
دوائر كهربية
الكترونيات
ميكانيكا الانشائات
هيدروليكا

Assignment No (2)

Analysis of Statically determinate beams

1. Calculate the support reactions for the loaded beam shown below, and then draw SFD & BMD



Check for stability and determancy

$r = c + 3$

$3 = 0 + 3$ stable and determinate

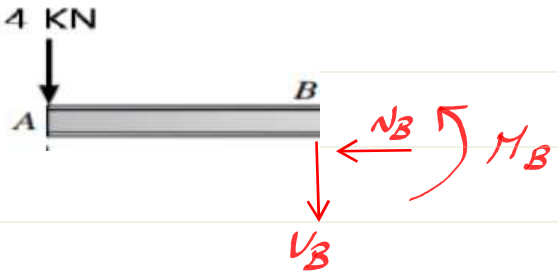
reactions

$\Sigma f_x = H_c = 0$

$\Sigma f_y = -4 - 16 + V_c = 0 \Rightarrow V_c = 20\ KN \uparrow$

$\Sigma M_c = M_c - 16 * 4 - 4 * 14 = 0 \Rightarrow M_c = 120\ KN.m \circlearrowleft$

for section AB



$\Sigma f_x = N_B = 0$

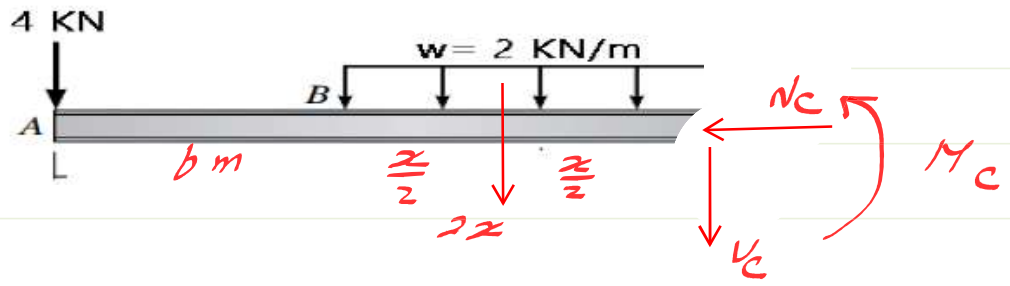
$\Sigma f_y = -4 - V_B = 0 \Rightarrow V_B = -4\ kN$

$\Sigma M_B = -M_B - 4x = 0 \Rightarrow M_B = -4x$

at $x = 0 \Rightarrow V_B = -4\ kN$, $M_B = 0$

at $x = 6 \Rightarrow V_B = -4\ kN$, $M_B = -24\ kN.m$

for section AC



$\Sigma f_x = N_C = 0$

$\Sigma f_y = -4 - 2x - V_C = 0 \Rightarrow V_C = -2x - 4$

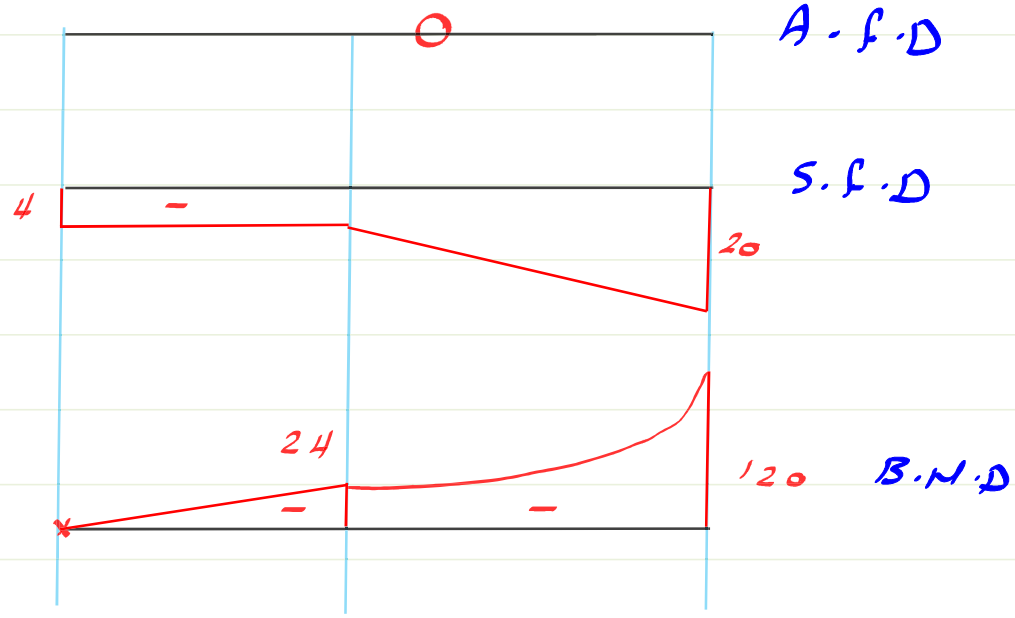
$\Sigma M_C = -M_C - 2x\left(\frac{x}{2}\right) - 4(6 + x) = 0$

$M_C = -x^2 - 4x - 24$

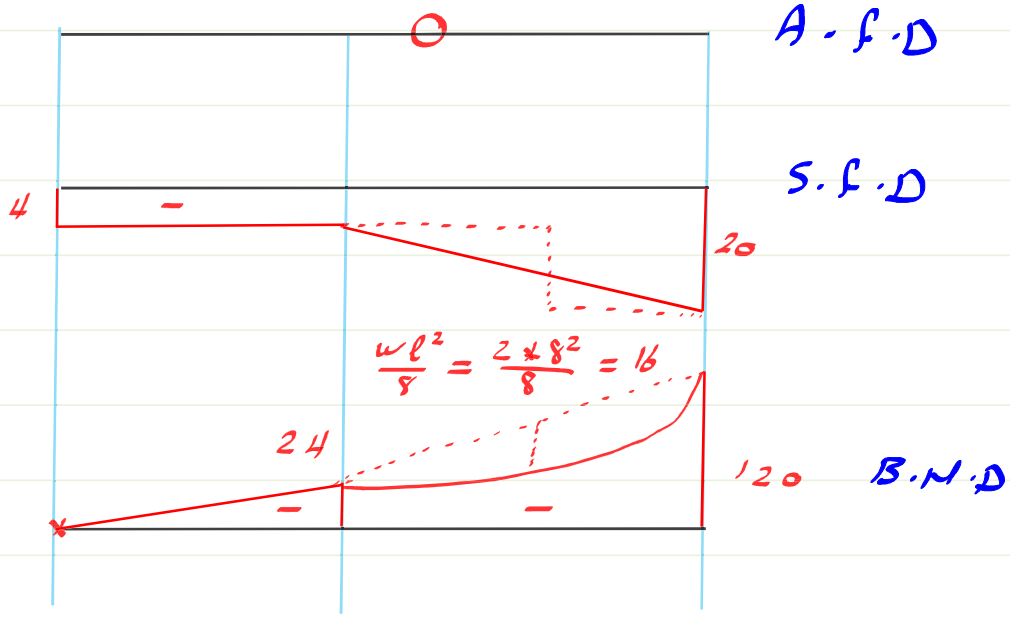
at $x = 0 \Rightarrow V_C = -4$, $M_C = -24$

at $x = 8 \Rightarrow V_C = -2 * 8 - 4 = -20\ kN$

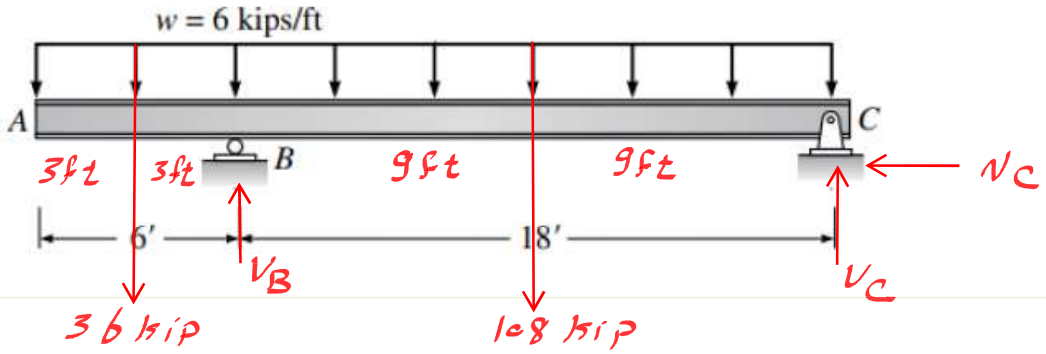
$M_C = -8^2 - 4 * 8 - 24 = -120\ kN.m$



another solution



2. Draw the shear and moment curves for the uniformly loaded beam in Figure below.



check for stability and determancy

$r = c + 3$

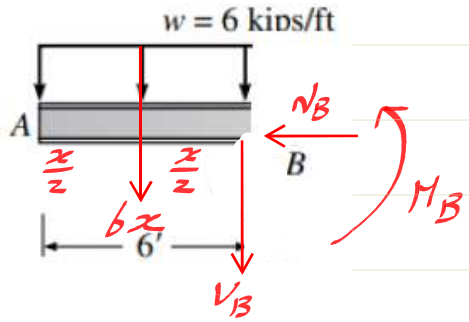
$3 = 0 + 3$ stabb and determinate reactions

$\Sigma f_x = N_C = 0$

$\Sigma M_B = -36*3 + 108*9 - V_C * 18 = 0 \Rightarrow V_C = 48$ kip

$\Sigma f_y = -36 + V_B - 108 + 48 = 0 \Rightarrow V_B = 96$ kip

for section AB



$\Sigma f_x = N_B = 0$

$\Sigma f_y = -6x - V_B = 0$

$V_B = -6x$

$\Sigma M_B = -M_B - 6x(\frac{x}{2}) = 0$

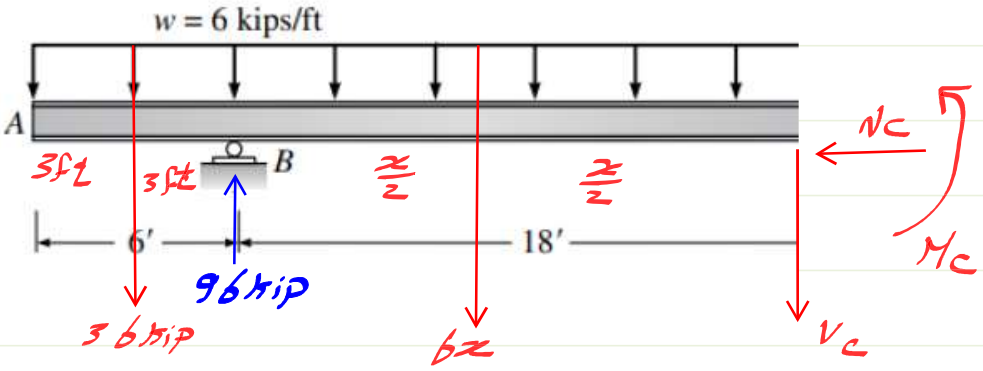
$M_B = -3x^2$

at $x = 0 \Rightarrow V_B = 0, \quad M_B = 0$

at $x = 6 \Rightarrow V_B = -6 * 6 = -36$ kip

$M_B = -3 * 6^2 = -108$ kip.ft

for section AC



$\Sigma f_x = N_c = 0$

$\Sigma f_y = -36 + 96 - 6x - V_c = 0 \Rightarrow V_c = 60 - 6x$

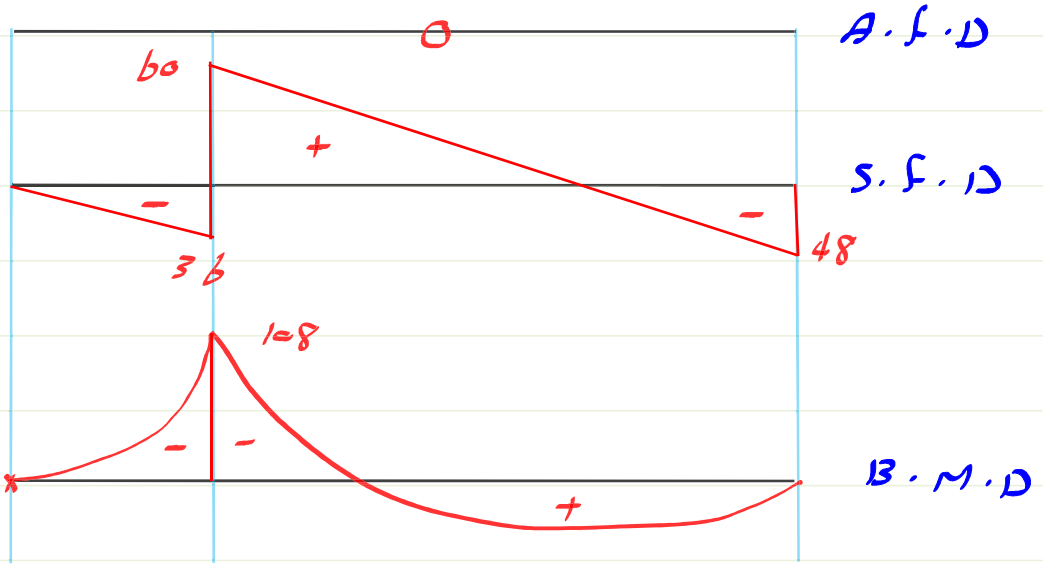
$\Sigma M_c = -M_c - 6x(\frac{x}{2}) + 96x - 36(3 + x) = 0$

$M_c = -3x^2 + 60x - 108$

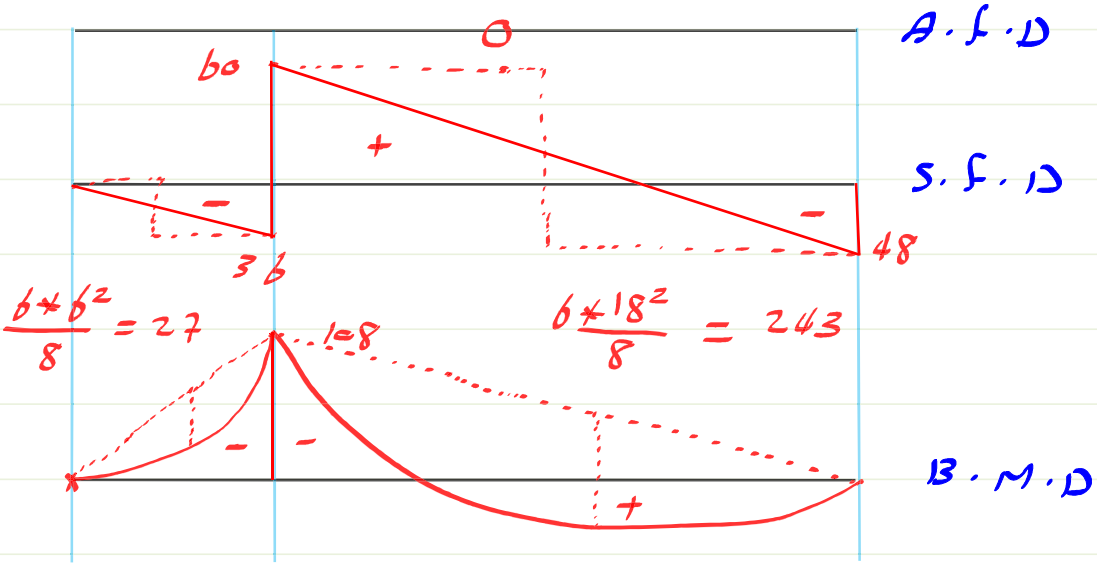
at $x = 0 \Rightarrow V_c = 60$ kip, $M_c = -108$ kip.ft

at $x = 18 \Rightarrow V_c = 60 - 6 * 18 = -48$ kip

$M_c = -3(18)^2 + 60(18) - 108 = 0$

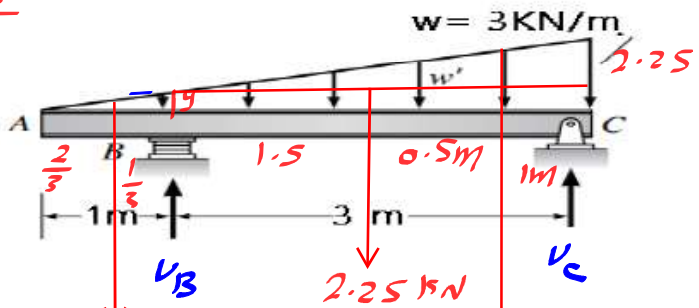

د . ق . ع
0
6o
+
د . ق . ر
-
-
48
3 6
108
- -
د . ع . ث
+

حل آخر


د . ق . ع
0
6o
+
د . ق . ر
-
-
48
3 6
6*6²/8 = 27
108
6*18²/8 = 243
- -
د . ع . ث
+

3. Determine the support reactions for the loaded beam shown below, and then draw SFD & BMD

$\frac{y}{1} = \frac{3}{4}$



$0.5 * 1 * \frac{3}{4} = \frac{3}{8}$

0.375 kN

$0.5 * 3 * 2.25$

3.375 kN

Check for stability

$r = c + 3$

$3 = 0 + 3$ stable and determinate

Reactions

$\Sigma M_B = -0.375 * \frac{1}{3} + 2.25 * 1.5 + 3.375 * 2 - V_C * 3 = 0$

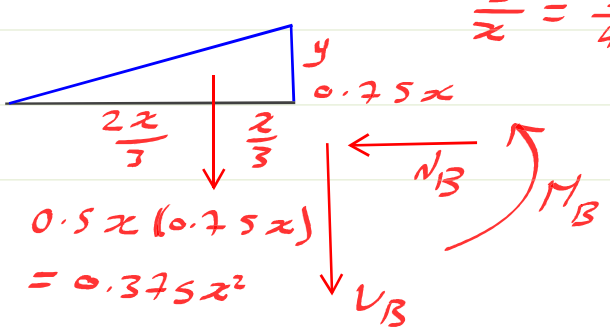
$V_C = 3.33 kN \uparrow$

$\Sigma f_y = -0.375 + V_B - 2.25 - 3.375 + 3.33 = 0 \Rightarrow$

$V_B = 2.67 kN$

for section AB

$\frac{y}{x} = \frac{3}{4} \Rightarrow y = 0.75x$



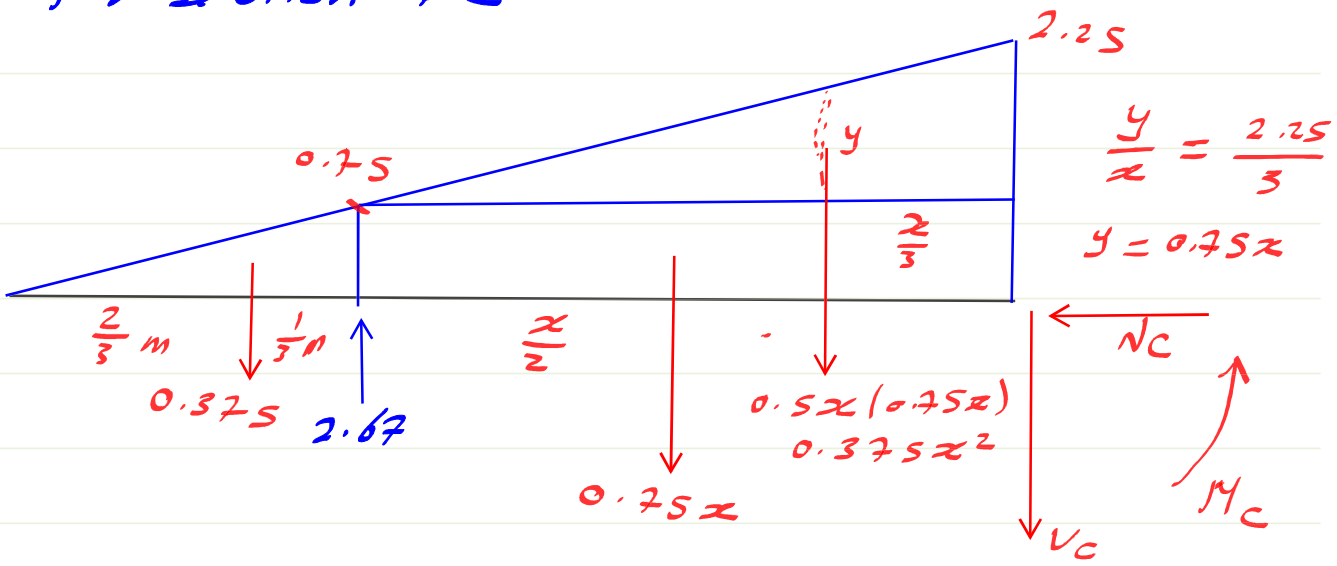
$$\Sigma f_y = -0.375x^2 - V_B = 0 \Rightarrow V_B = -0.375x^2$$

$$\Sigma M = -M_B - 0.375x^2 + \frac{1}{3}x = 0 \Rightarrow M_B = -0.125x^3$$

at $x = 0 \Rightarrow V_B = 0,\ M_B = 0$

at $x = 1 \Rightarrow V_B = -0.375\ kN,\ M_B = -0.125\ kN.m$

for section BC



$$\Sigma f_y = -0.375 + 2.67 - 0.75x - 0.375x^2 - V_C = 0$$

$$V_C = 2.295 - 0.75x - 0.375x^2$$

$$\Sigma M_C = -M_C - 0.375x^2\left(\frac{1}{3}x\right) - 0.75x\left(\frac{x}{2}\right) + 2.67x - 0.375\left(x + \frac{1}{3}\right) = 0$$

$$M_C = -0.125x^3 - 0.375x^2 + 2.295x - 0.125$$

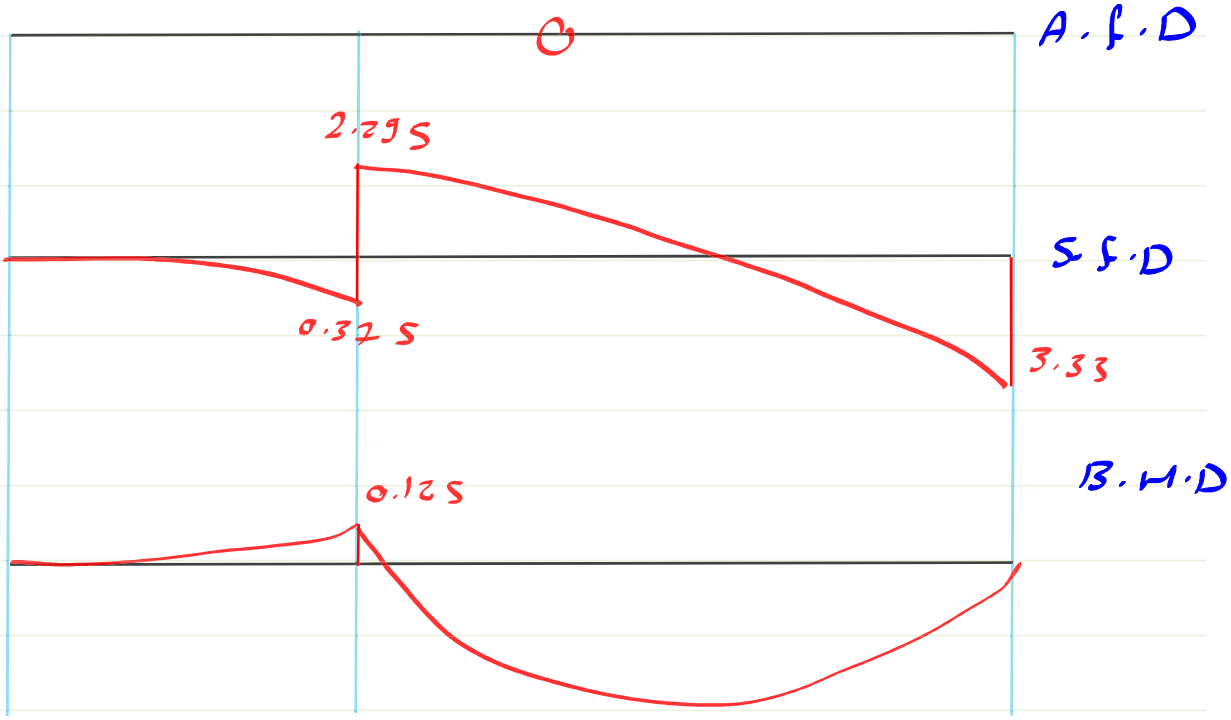
at $x = 0 \Rightarrow V_C = 2.295,\ M_C = -0.125\ kN.m$

at $x = 3 \Rightarrow V_C = 2.295 - 0.75 \times 3 - 0.375 \times 3^2$

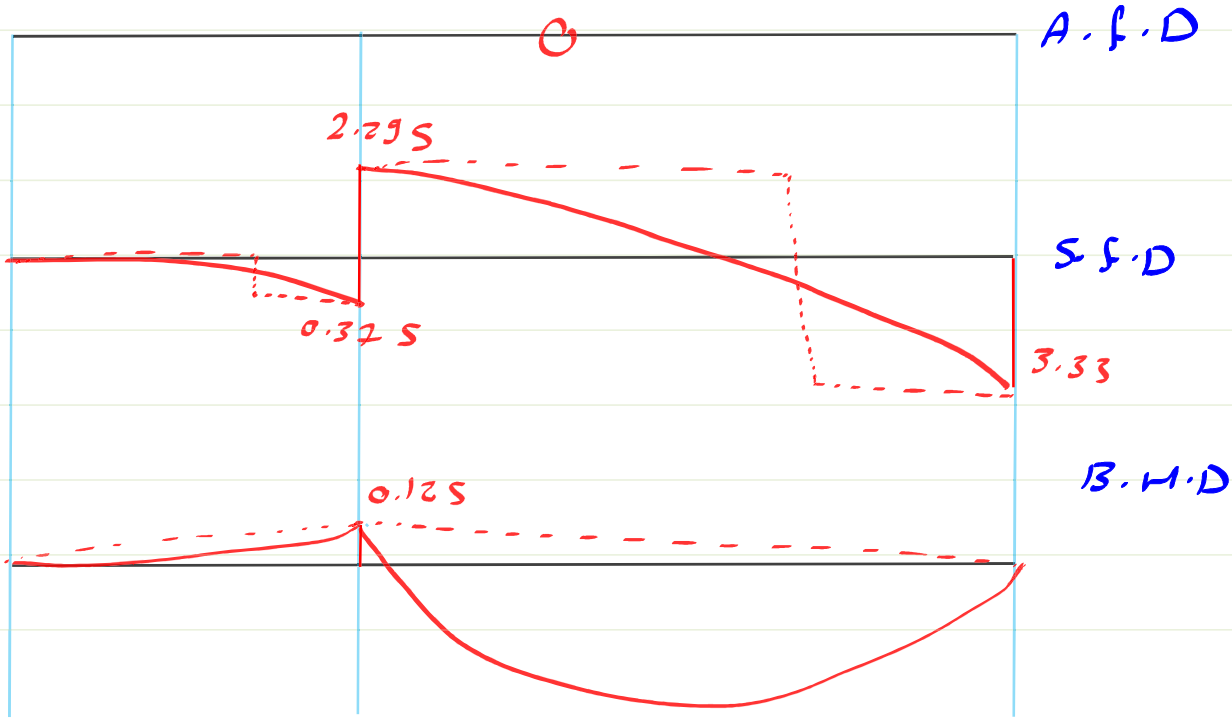
$$V_C = -3.33\ kN$$

$$M_c = -0.125 \times 3^3 - 0.375 \times 3^2 + 2.295 \times 3 - 0.125$$

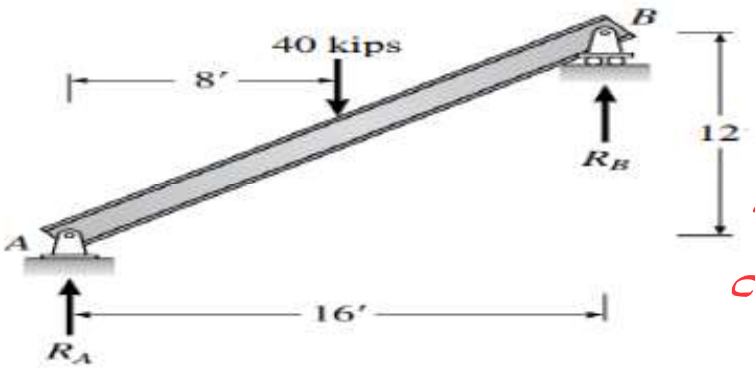
$$M_c = 0$$



another solution



3. Plot the shear and moment curves for the inclined beam in Figure below.



20, 12, 16, θ

$\sin\theta = \frac{12}{20} = 0.6$

$\cos\theta = \frac{16}{20} = 0.8$

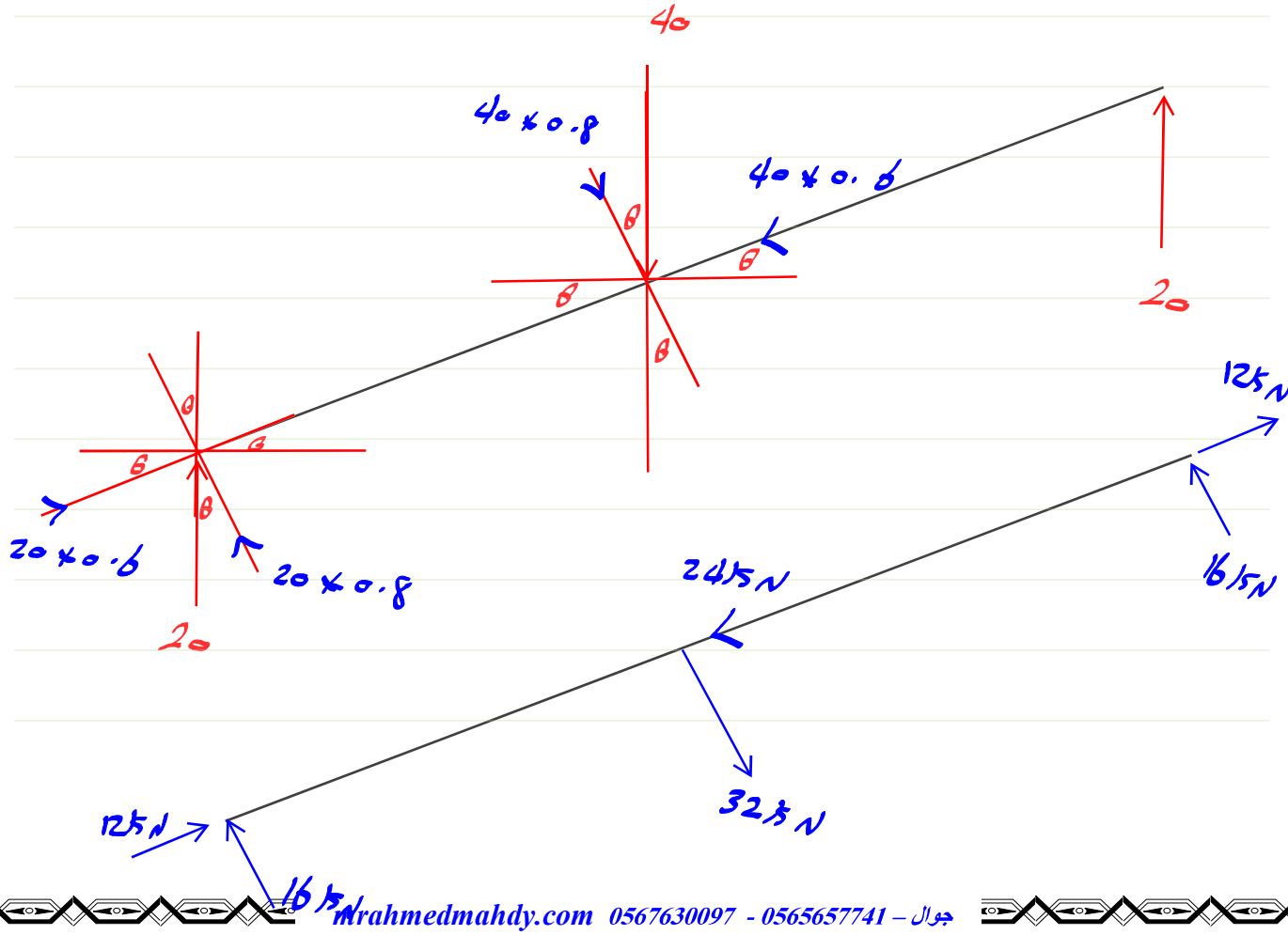
determinacy

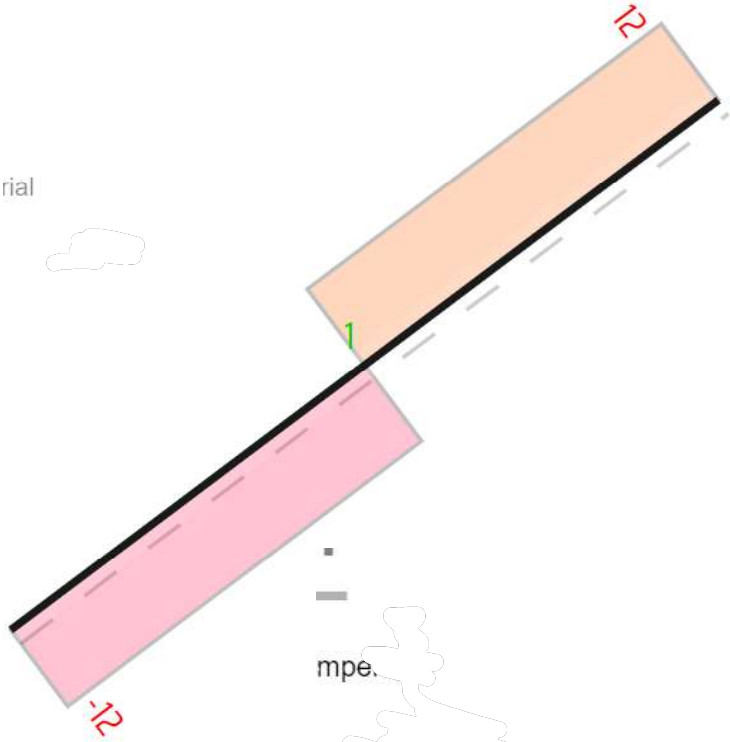
$r = c + 3$

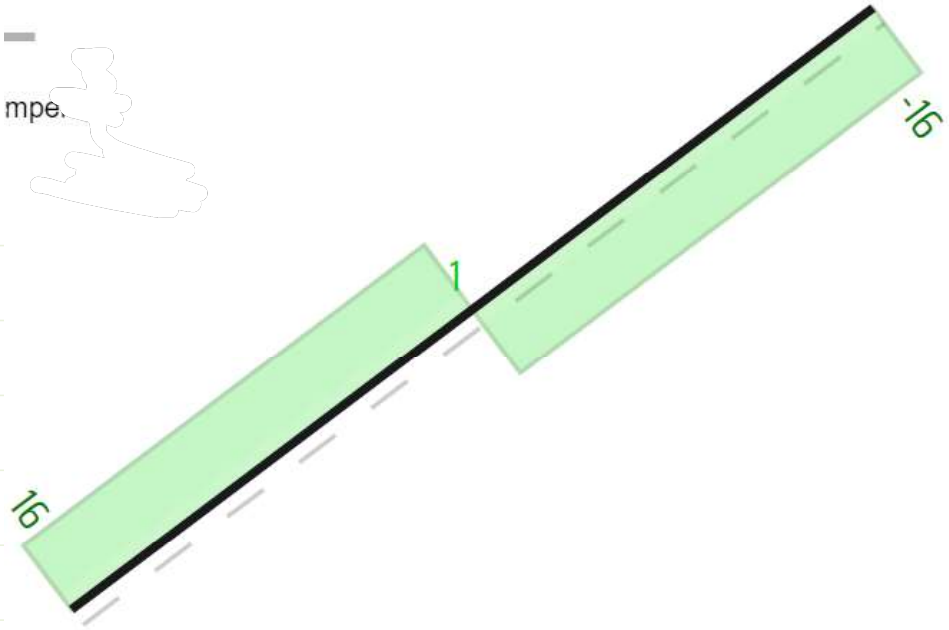
$3 = e + 3 \Rightarrow$ stable and determinate

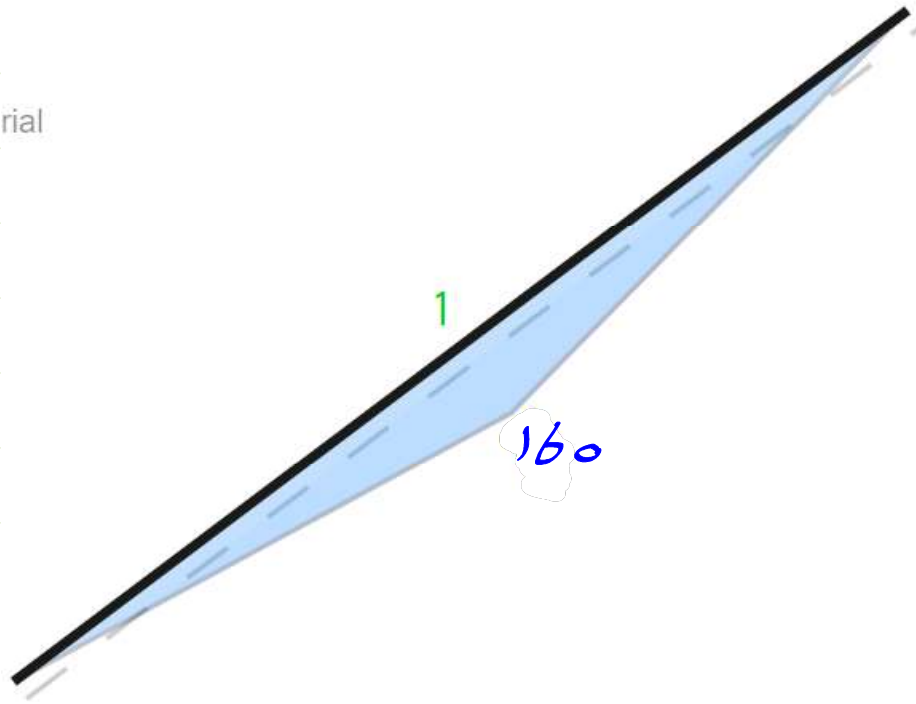
reactions

$R_A = R_B = 20$ kips




12
1
-12


-16
1
16


1
١٦٥