Lecture 23

Monday, October 23, 2017 11:44

To do ...

- TAM 210 final
  - CBTF – 1hr 50 mins
  - Thurs – Sunday // Nov 9th – Nov 12th
- TAM 211 final
  - CBTF
  - Dec 14th – Dec 20th (tentative)

- HW 16 PL due **Tues**
- HW 17 ME due **Thurs**

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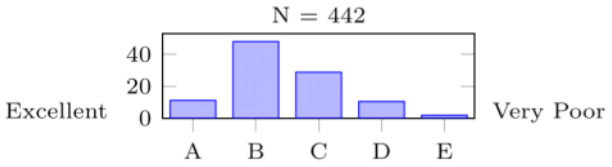
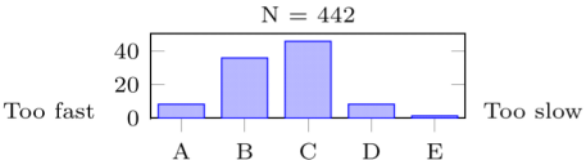
Thank You !!

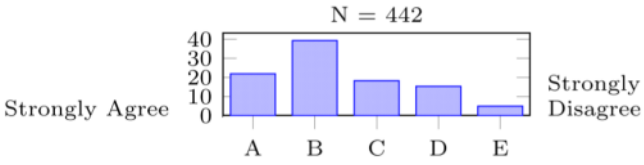
2. Overall course quality



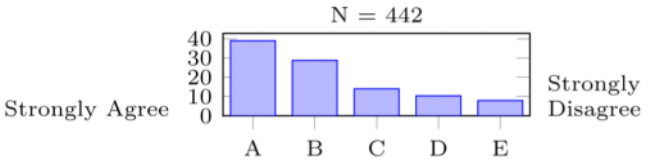
3. Lecture pace



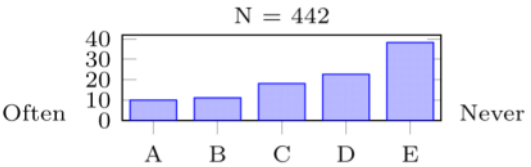
5. Lectures help me better understand the course material



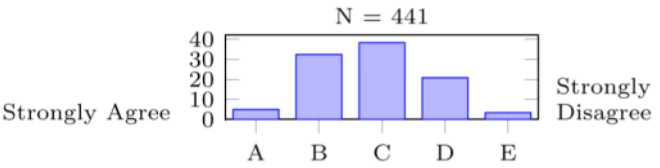
6. I make use of posted lecture notes



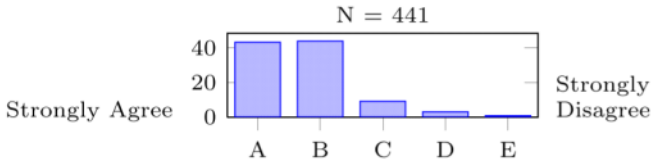
8. I go to office hours for help



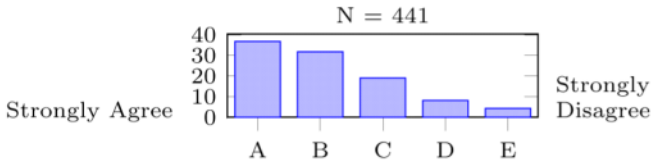
14. I find the online homework too difficult



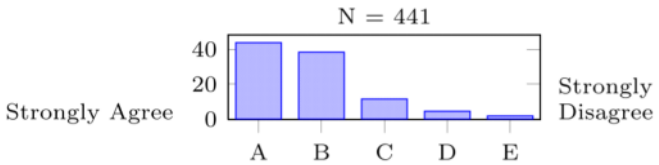
17. The homework helps me understand course material



18. The homework prepares me for the quizzes



24. The TA/CA checks to see that our group understands the worksheet rather than looking only at whether we have completed the activity



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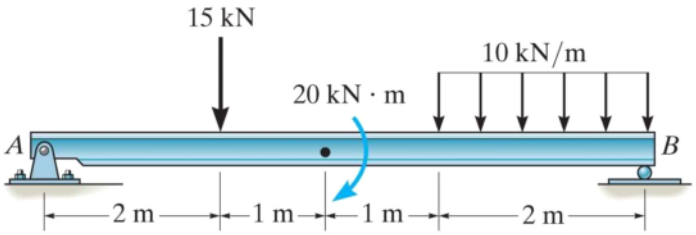
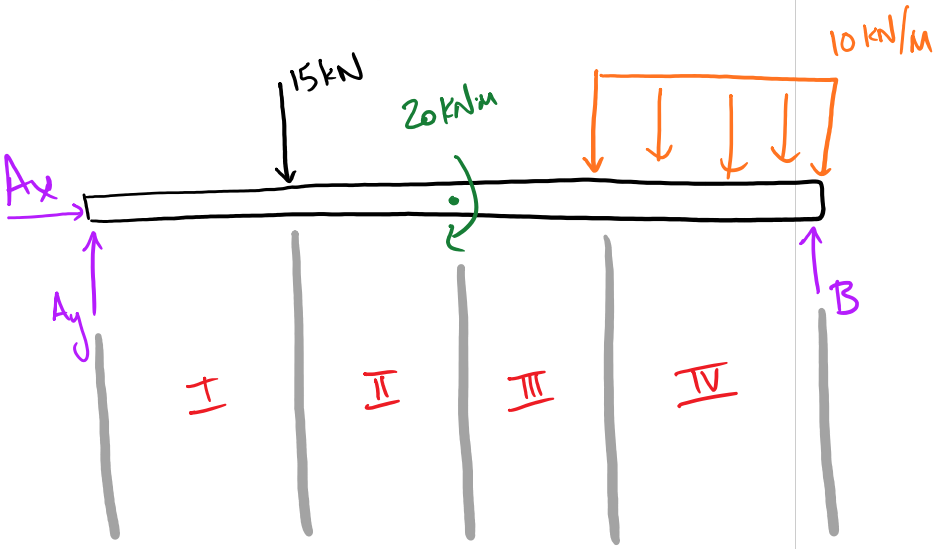
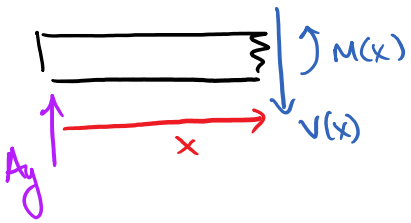


Draw the shear and moment diagrams for the beam.



Region I :



$\Sigma F_y = 0$

$A_y - V(x) = 0$ $\therefore$ $V(x) = A_y$

Positive Constant

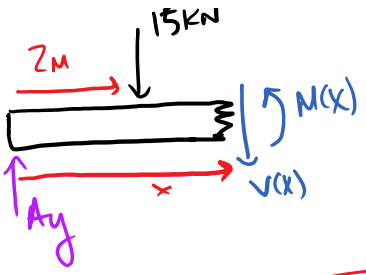
$\Sigma M_0 = 0$

$M(x) - xA_y = 0$ $\therefore$ $M(x) = xA_y$

linear w/slope Ay

Region II :

Region II :



$\Sigma F_y = 0$

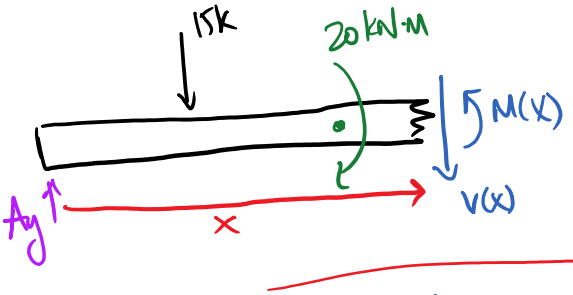
$A_y - 15k - V(x) = 0 \quad \therefore \quad \boxed{V(x) = A_y - 15k}$ — negative, constant

$\Sigma M = 0$

$M(x) - xA_y + (x-2)15k = 0$

$\boxed{M(x) = x(A_y - 15k) + 30k}$ — linear w/neg. slope

Region III :



$\Sigma F_y = 0$

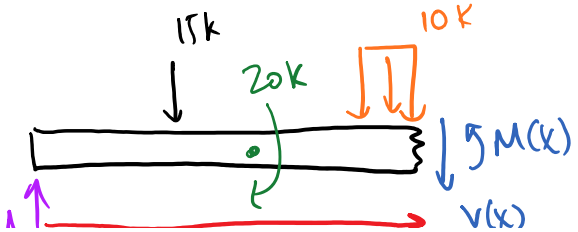
$A_y - 15k - V(x) = 0 \quad \therefore \quad \boxed{V(x) = A_y - 15k}$

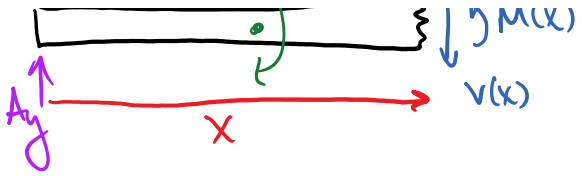
$\Sigma M = 0$

$M(x) - 20k - xA_y + (x-2)15k = 0$

$\boxed{M(x) = x(A_y - 15k) + 50k}$

Region IV :





$\Sigma F_y = 0$

$$A_y - 15k - 10k(x-4) - V(x) = 0$$

$$\boxed{V(x) = (A_y + 25k) - x(10k)}$$

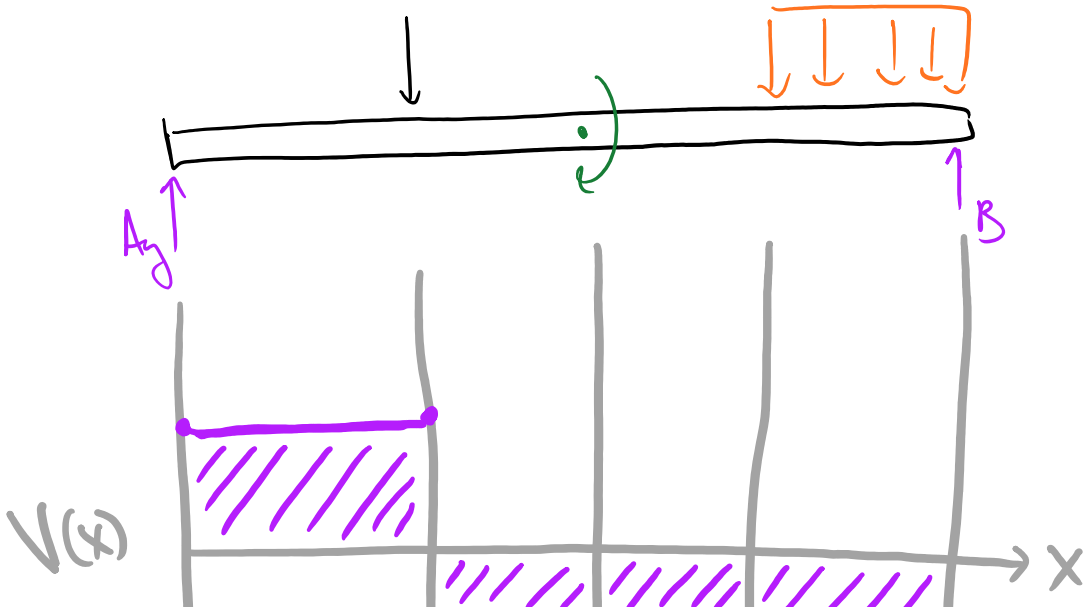
$\Sigma M = 0$

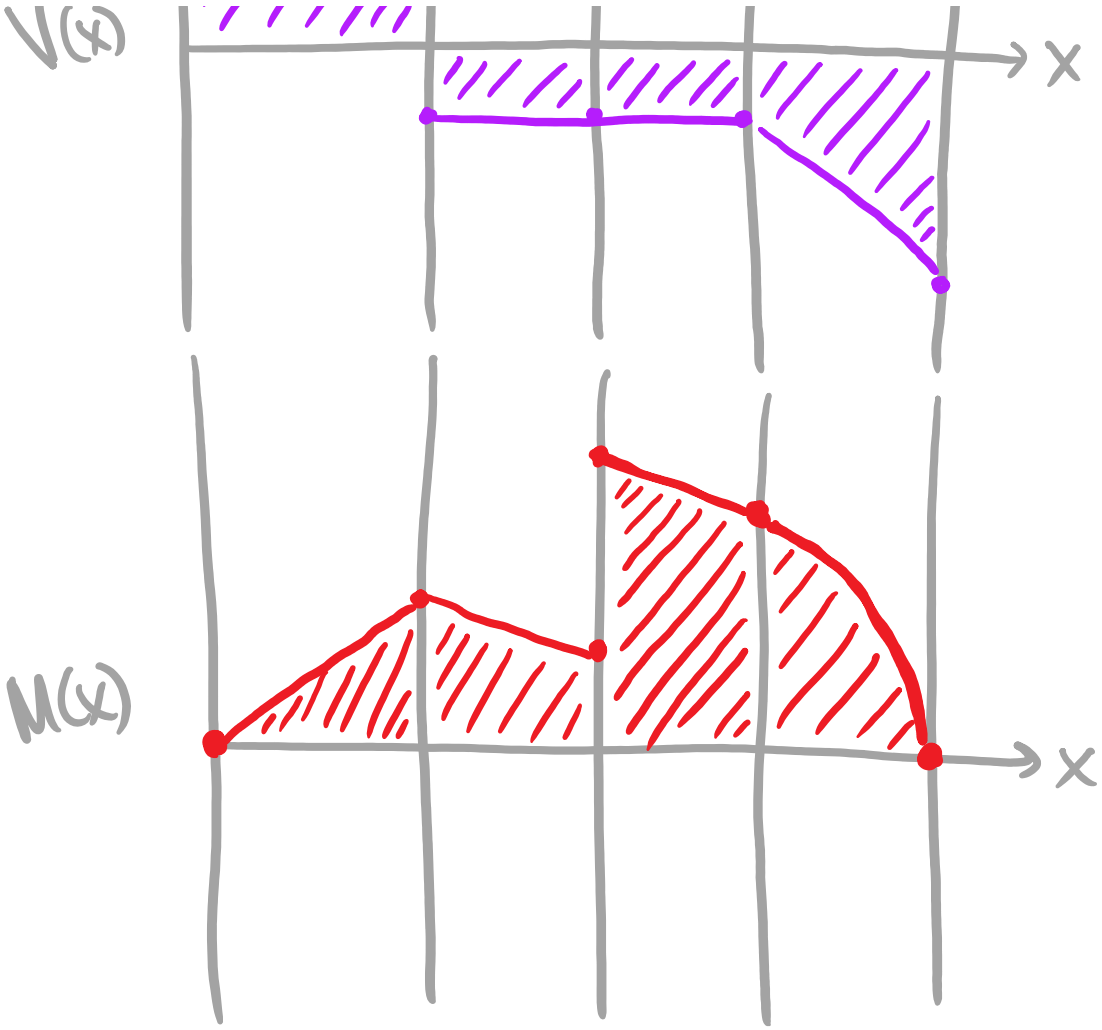
$$M(x) - 20k - xA_y + (x-2)15k + (x-4)(10k)\cdot\left(\frac{x-4}{2}\right) = 0$$

$$M(x) = 20k + 30k + xA_y - x\,15k - (x-4)^2\,5k$$

$$\boxed{M(x) = 50k + x(A_y - 15k) - (x-4)^2 5k}$$

Now the Shear and Moment diagrams!




V(x)
x
M(x)
x

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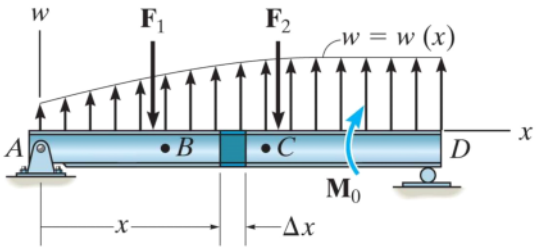
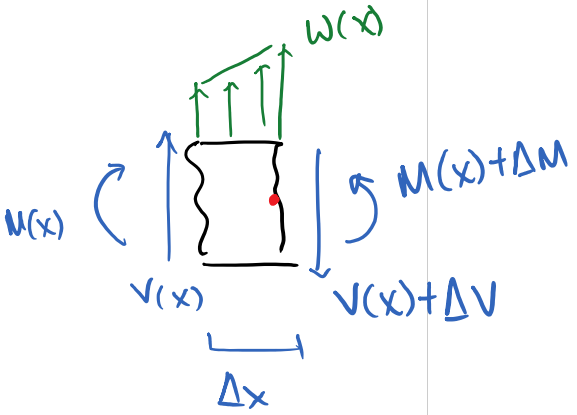
Relations Among Load, Shear and Bending Moments



Consider the beam element:



Shear force :

$\Sigma F_y: \quad V(x) - V(x) - \Delta V + w(x)\Delta x = 0$

$V - V - \Delta V + w(x)\Delta x = 0$

$\Delta V = w(x)\Delta x$

the moment :

$\Sigma M_0:$

$-M(x) + M(x) + \Delta M - V\Delta x - \beta\Delta x\left(w(x)\Delta x\right) = 0$

$\Delta M = V\Delta x + \beta w(x)\Delta x^2$

in the limit that $\Delta x \to 0$

$$\frac{dV}{dx} = w(x)$$

Slope of Shear = Dist load intensity

$$\frac{dM}{dx} = V(x)$$

Slope of Moment = Shear

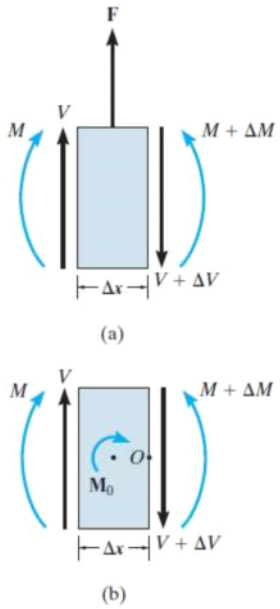
$$\Delta V = V_2 - V_1 = \int w(x)\,dx$$

Change in Shear = Area under loading curve

$$\Delta M = M_2 - M_1 = \int V(x)\,dx$$

Change in moment = Area under Shear

Wherever there is an external concentrated force, or a concentrated moment, there will be a change (jump) in shear or moment respectively.



Shear:

$\Sigma F_y: \quad V + F - V - \Delta V = 0 \quad \therefore \Rightarrow \quad \boxed{\Delta V = F}$

moment:

$\Sigma M_o: \quad M + \Delta M - M - M_o - \Delta x V = 0$

$\Delta M = M_o + \Delta x V \quad \therefore \quad \boxed{\Delta M = M_o}$

$\lim_{\Delta x \to 0}$

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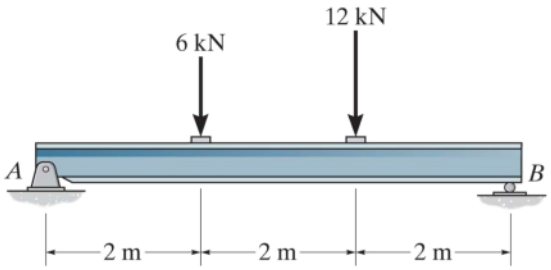
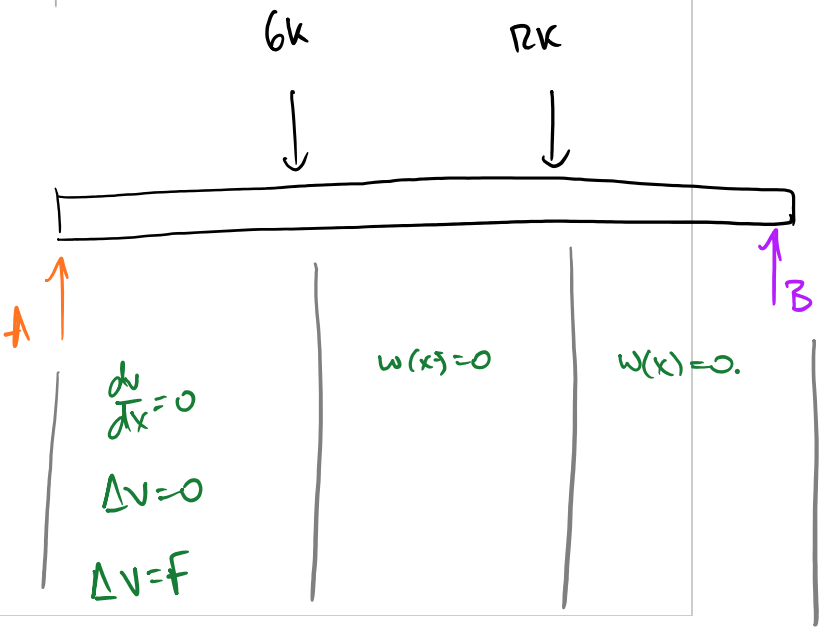


Draw the shear and moment diagrams for the beam.

1. DRAW FBD
2. Find support RXNS

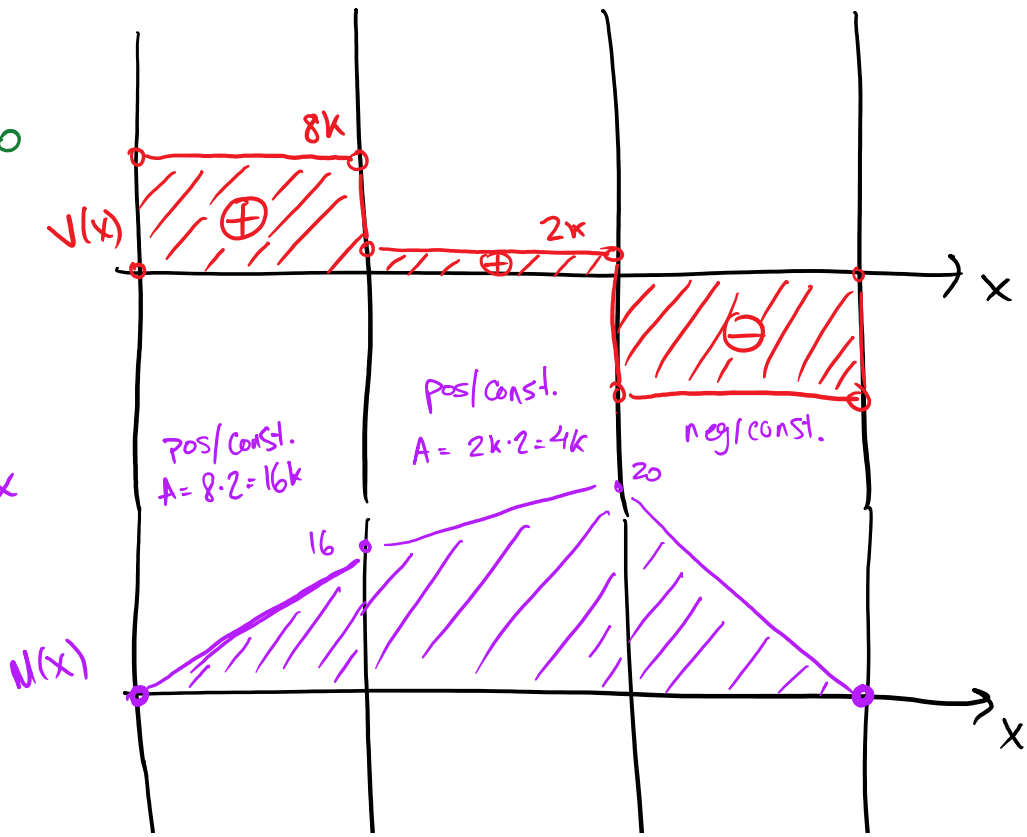


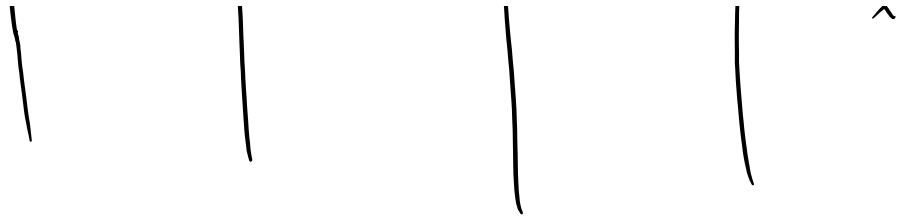
$$\frac{dV}{dx} = w(x) = 0$$

$$\Delta V = V_2 - V_1 = \int w(x)\,dx = 0$$

$$\frac{dM}{dx} = V$$

$$\Delta M = M_2 - M_1 = \int V(x)\,dx$$





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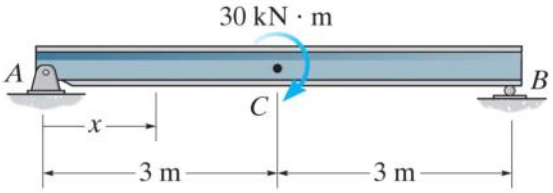
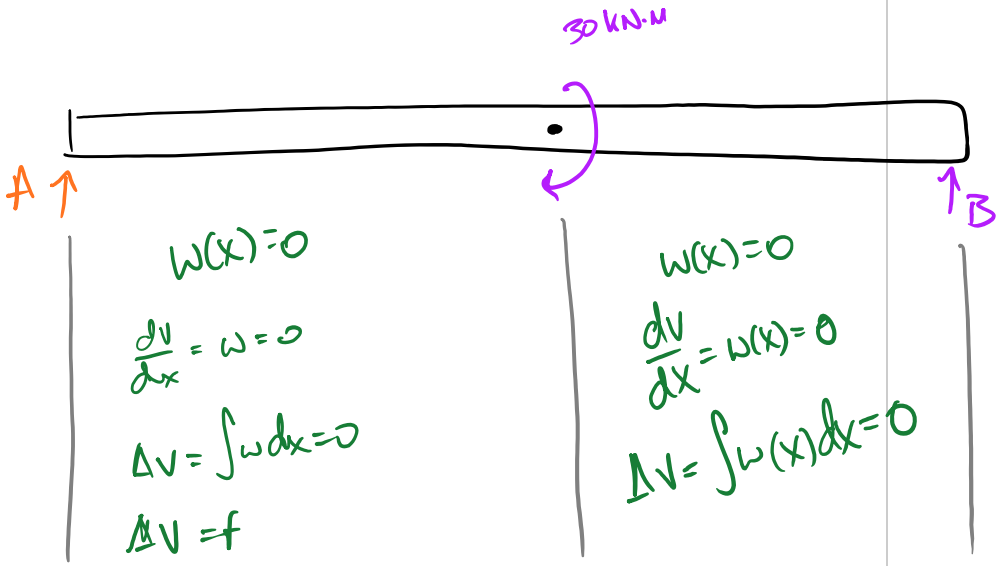
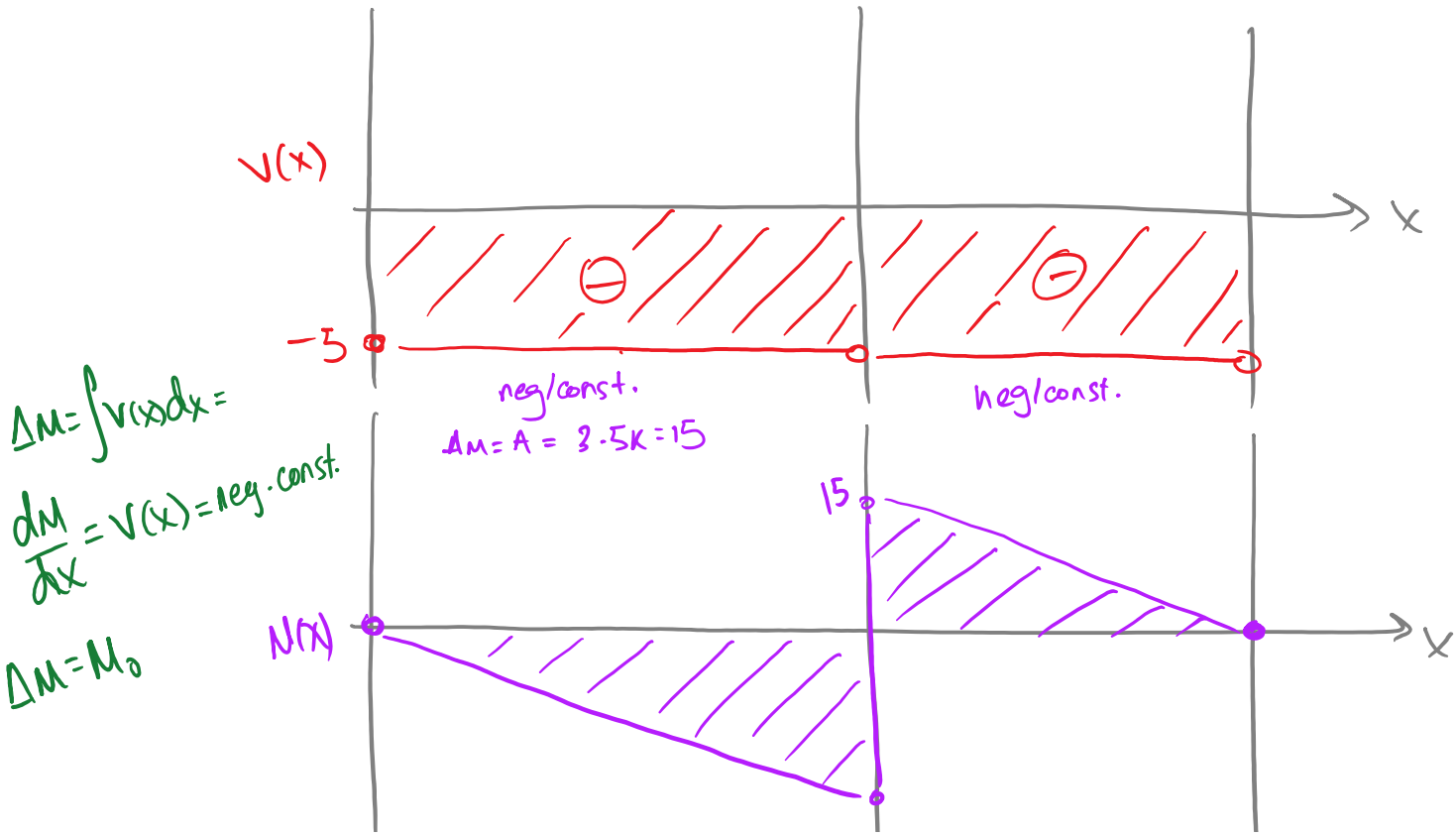
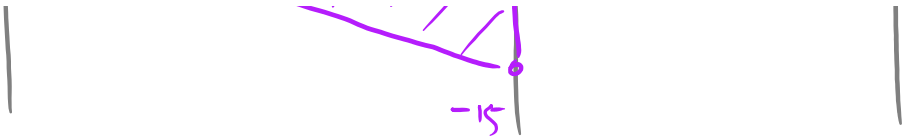


Draw the shear and moment diagrams for the beam.







$\Delta M = N_0$