MAE 343. Intermediate Mechanics

Chapter 3: Mechanics
Beam Diagrams

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Fall 2022

Example 1: Diving Board

Example 1: Diving Board, cont'd

Draw the V and M diagrams. Add eqns.

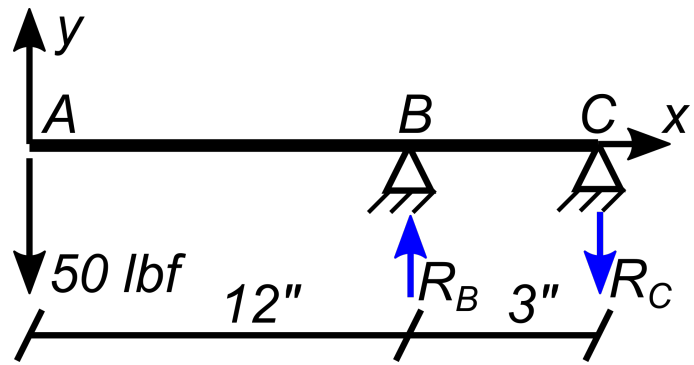
$\sum F_y = 0 : -50 + R_B - R_C = 0$

$\sum M_c = 0$: cancel unknown at C

$50x15 - R_B x3 = 0 :$

$R_B = 50x15/3 = 250$ lbf

From 1st eq. $R_C = R_B - 50 = 200$ lbf



Example 1: Diving Board, cont'd

$R_B = 250$ lbf

$R_C = 200$ lbf

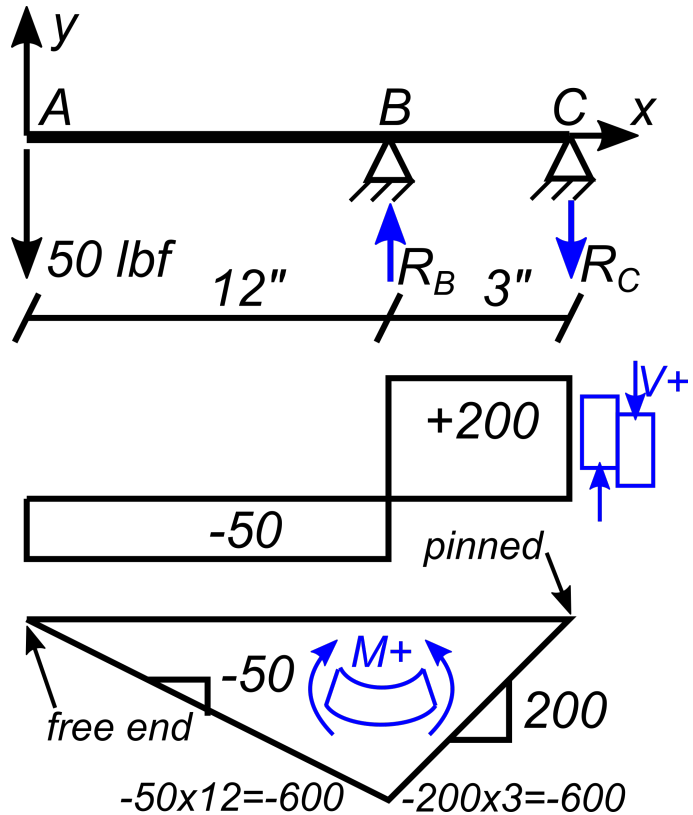
Using shear convention, draw the V-diagram.

Draw the M-diagram using the fundamental eqn. $V = dM/dx$, or $M = \int_0^x V\,dx$

Add eqns. to the diagrams:

$0 < x < 12 : M = -50x$

$12 < x < 15 : M = -600 + 200(x - 12)$



Example 2: Simply Supported Beam

Draw the V and M diagrams. Add eqns.

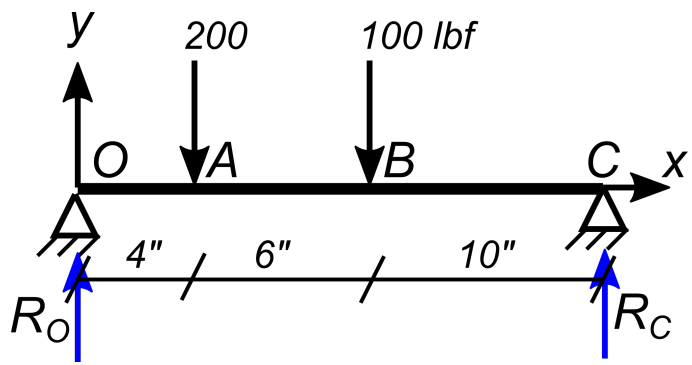
$\sum F_y = 0 : R_O + R_C = 300$

$\sum M_O = 0$: cancel unknown at O

$20R_C - 200x4 - 100x10 = 0$:

$R_C = (800 + 1000)/20 = 90$ lbf

From 1st eq. $R_O = 300 - 90 = 210$ lbf



Example 2: Simply Supported Beam, cont'd

Draw the V and M diagrams. Add eqns.

$R_C = 90$ lbf

$R_O = 210$ lbf

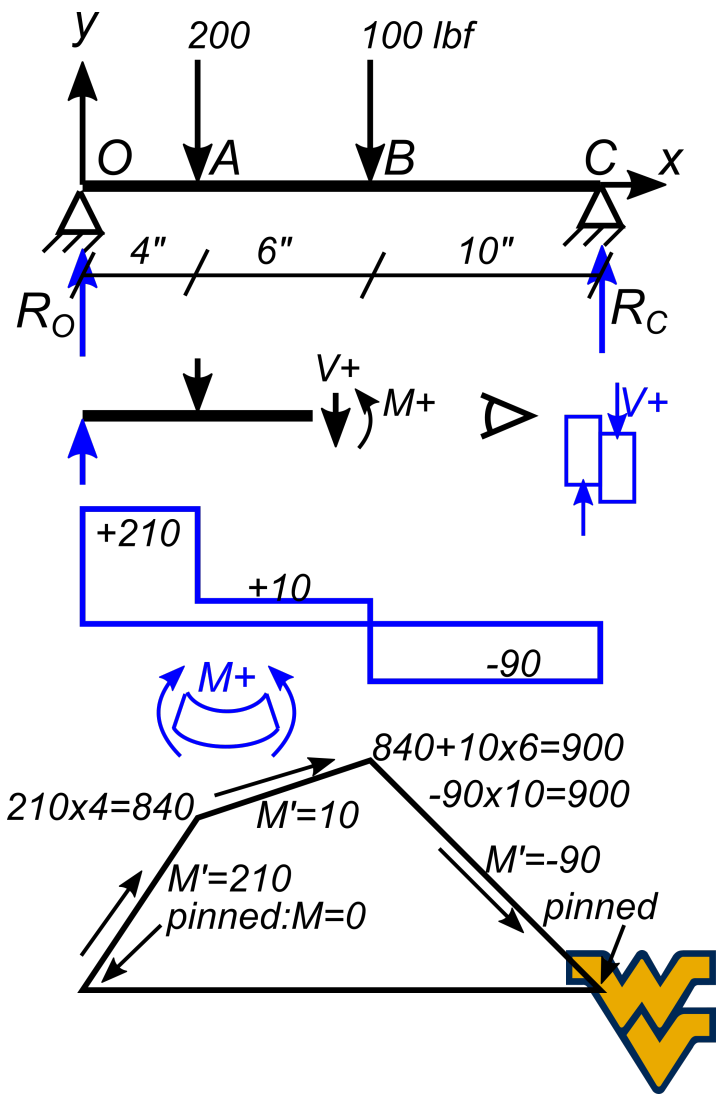
Using shear convention, draw the V-diagram.

Draw the M-diagram using the fundamental eqn. $V = dM/dx$, or $M = \int_0^x V\,dx$

$0 < x < 4 : M = 210x$

$4 < x < 10 : M = 840 + 10(x - 4)$

$10 < x < 20 : M = 900 - 90(x - 10)$



Example 3: Concentrated Moment

Draw the V and M diagrams. Add eqns.

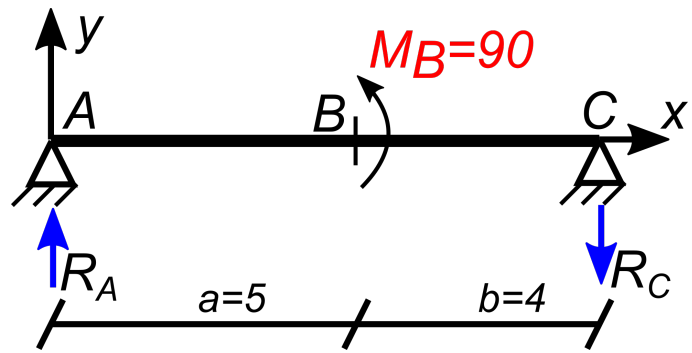
$R_A = R_C$

$\sum M_A = 0$: cancel unknown at A

$R_C(a+b) - M_B = 0$

$R_C = 90/(5+4) = 10$

From 1st eq. $R_A = 10$ lbf



Example 3: Concentrated Moment

Draw the V and M diagrams. Add eqns.

$R_C = 10$ lbf

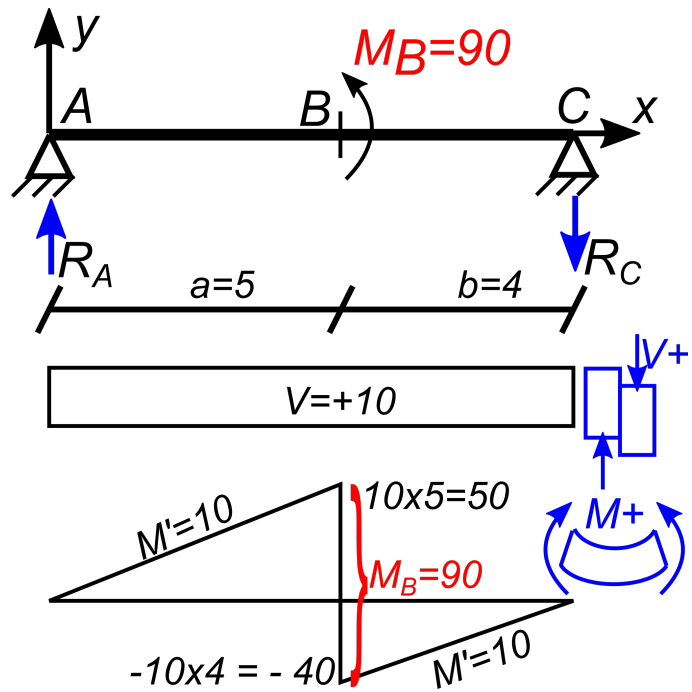
$R_A = 10$ lbf

Using shear convention, draw the V-diagram.

Draw the M-diagram using the fundamental eqn. $V = dM/dx$, or $M = \int_0^x V\,dx$

$0 < x < 5 : M = 10x$

$5 < x < 9 : M = -40 + 10(x - 5)$



Summary and Conclusions

- First, calculate the reactions.
- From the reactions, you get the shear diagram.
- From the shear diagram, you get the bending moment diagram.
- Homework is on WebWork
- Next lecture: Morh's circle 2D
- THANK YOU