

Shear Forces and Bending Moments in Beams

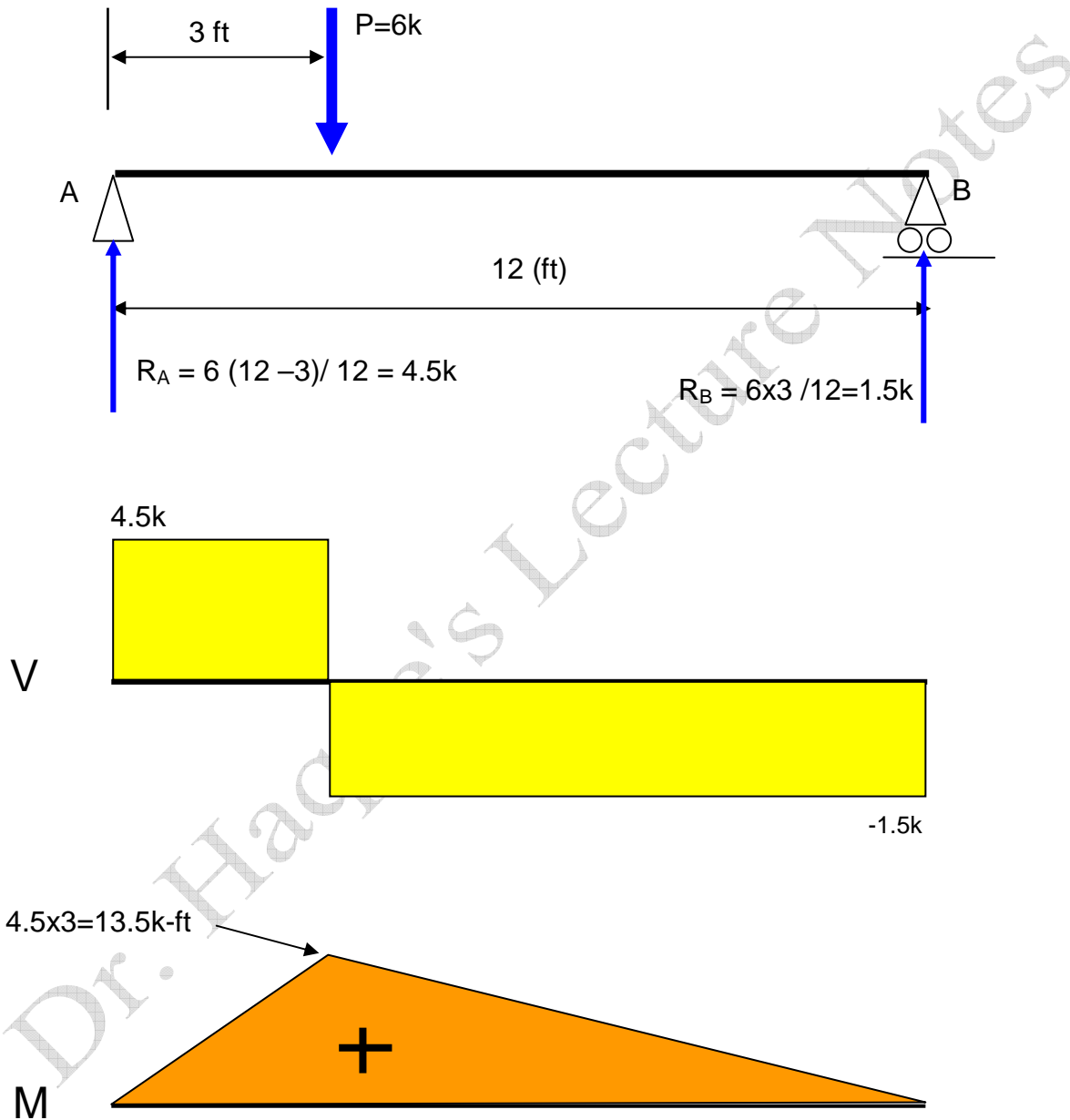
REACTIONS
SHEAR FORCE DIAGRAMS
MOMENT DIAGRAMS

[EXAMPLES]

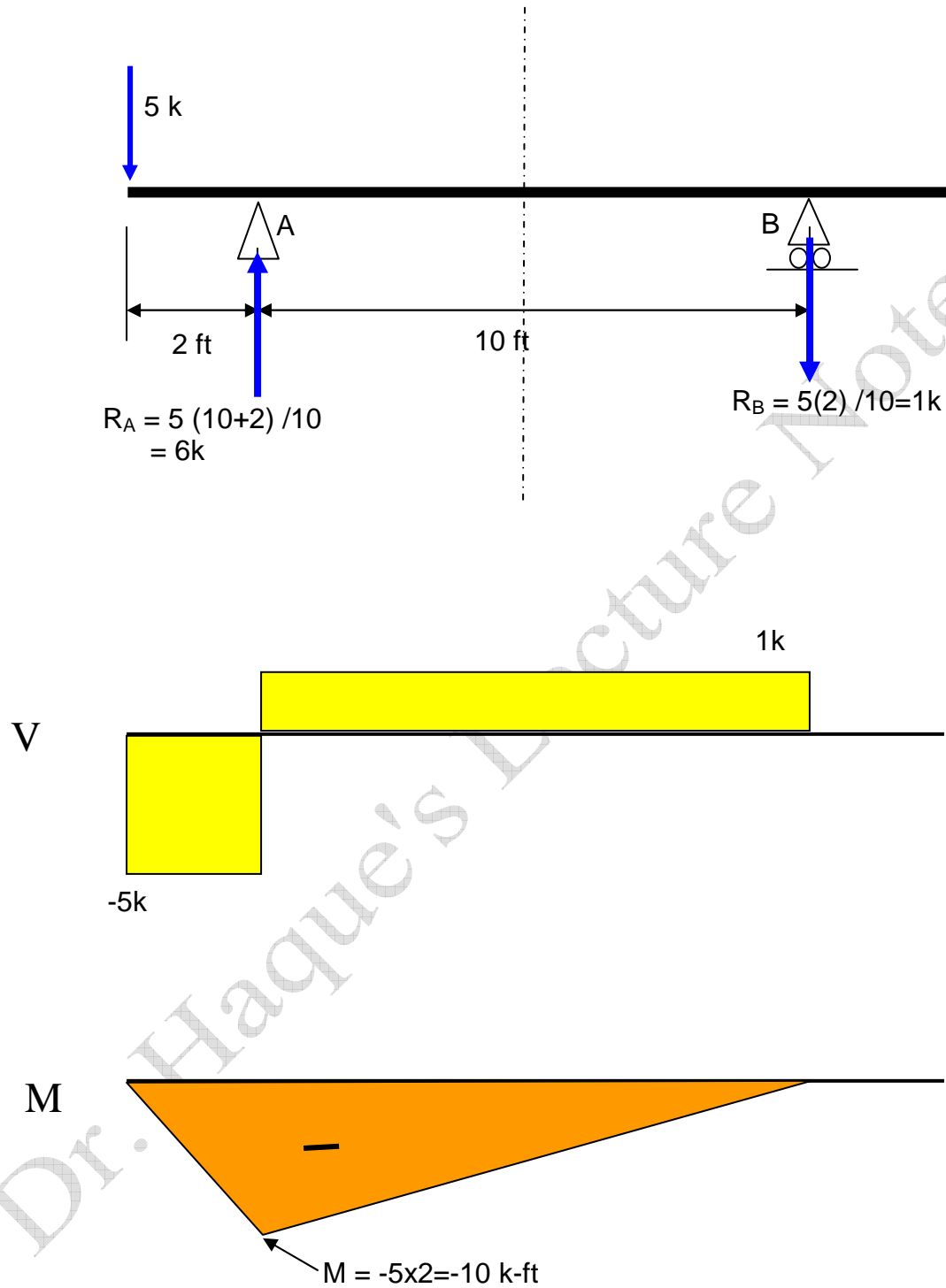
- Equilibrium Method for V and M Diagrams
- Semi-graphical Method for V and M Diagrams

Equilibrium Method for V and M Diagrams

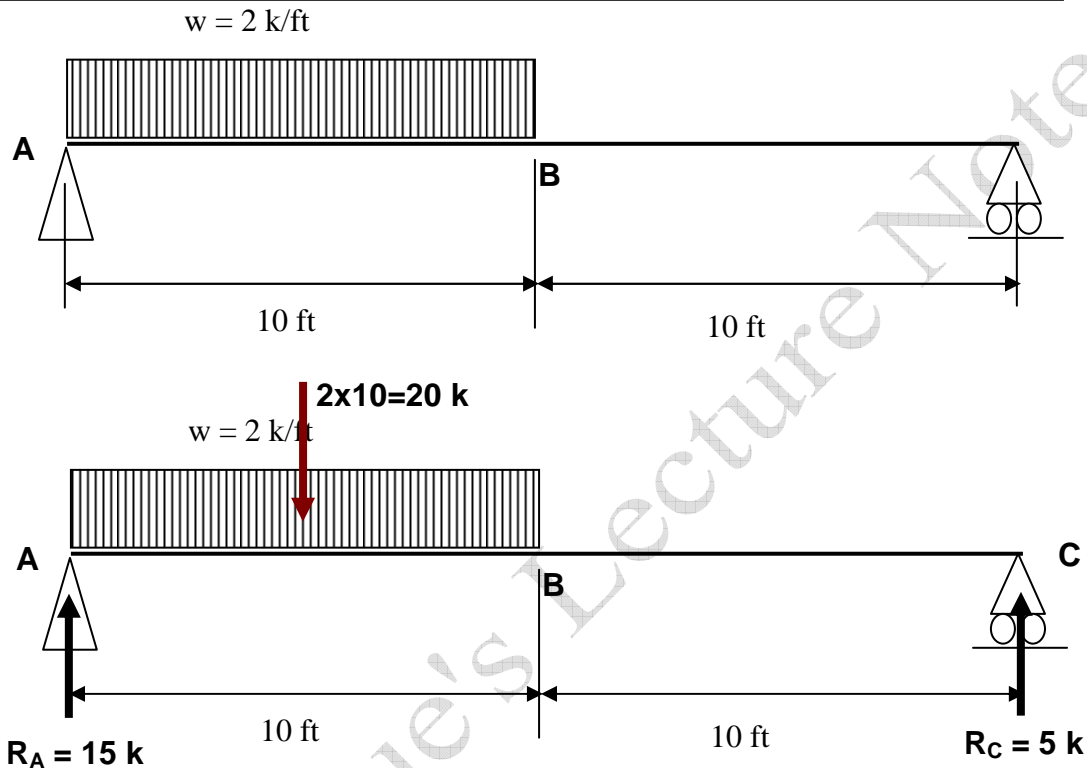
Q1:



Q2:



Q3: Find reactions, Shear Force, Location of zero shear force, Maximum Moment, Mid-span moment.



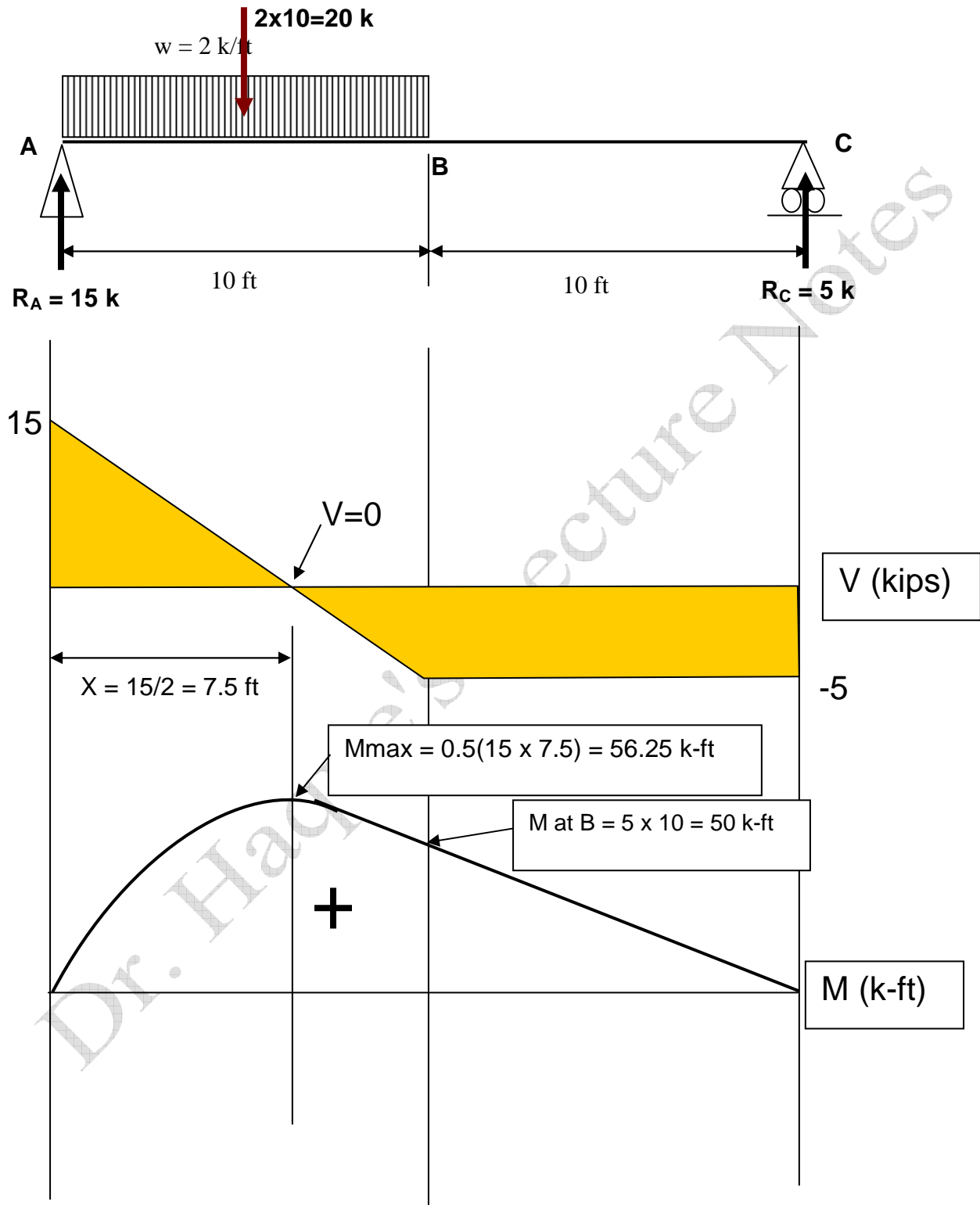
Take a moment about C and Find Reaction at A

$$R_A = (20 \times 15) / 20 = 15 \text{ kips}$$

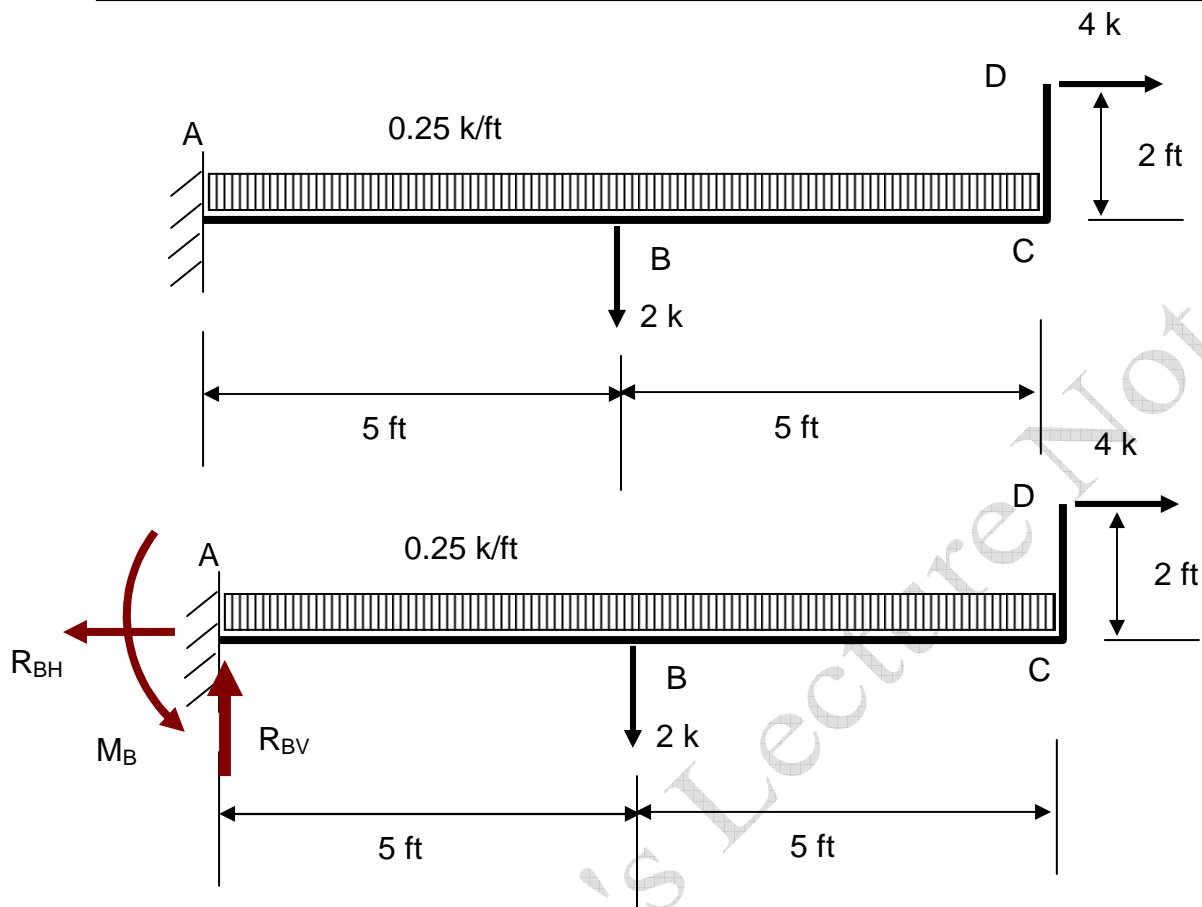
Take a moment about A and Find Reaction at C

$$R_C = (20 \times 5) / 20 = 5 \text{ kips}$$

[CHECK: Sum of all the forces Upward = sum of the all the forces downward
 $15 + 5 = 20 \text{ OK}$]



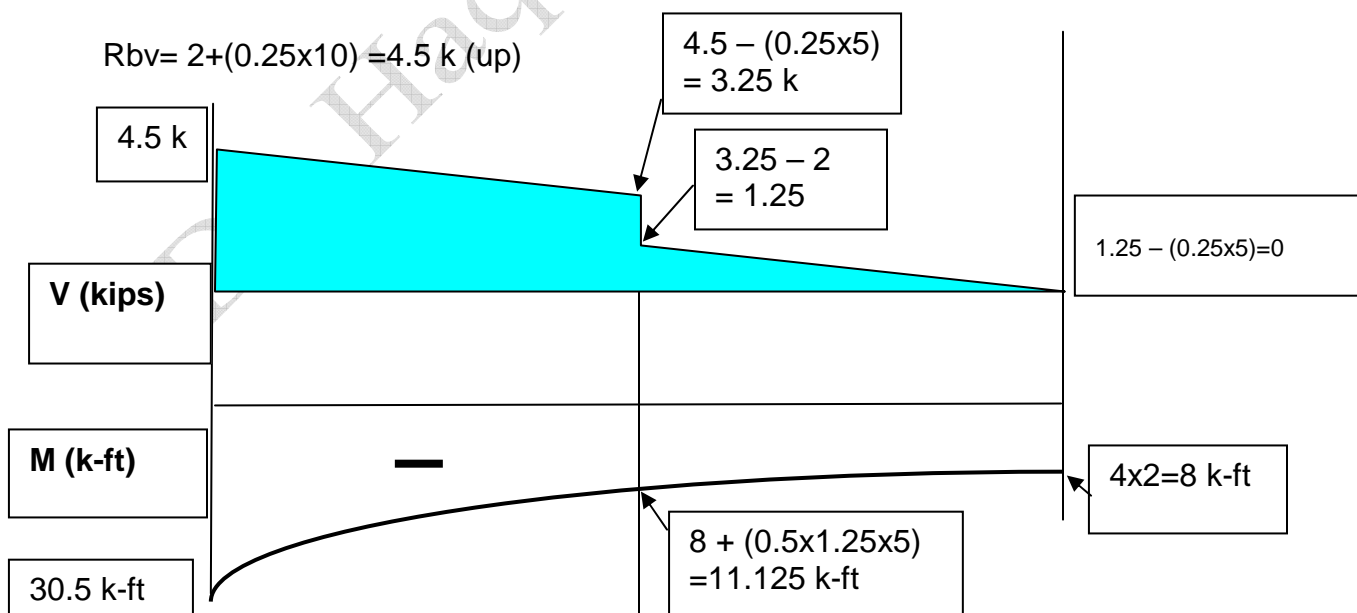
Q4: Find reactions, Support Moment; Draw Shear Force and Moment diagrams.



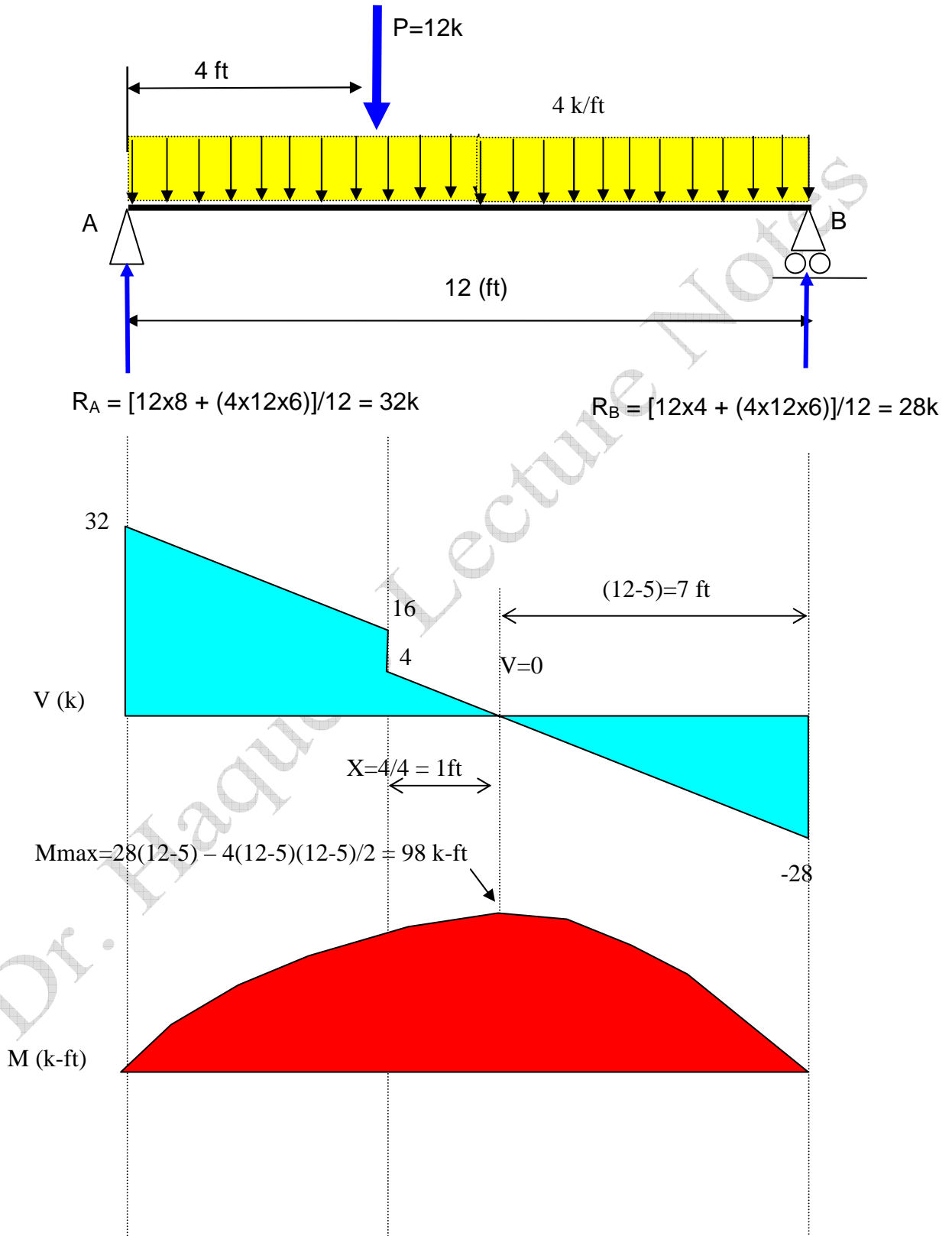
$$M_b = (4 \times 2) + (2 \times 5) + (0.25 \times 10 \times 5) = 30.5 \text{ k-ft (Anti-clockwise)}$$

$$R_{bh} = 4 \text{ k (towards left)}$$

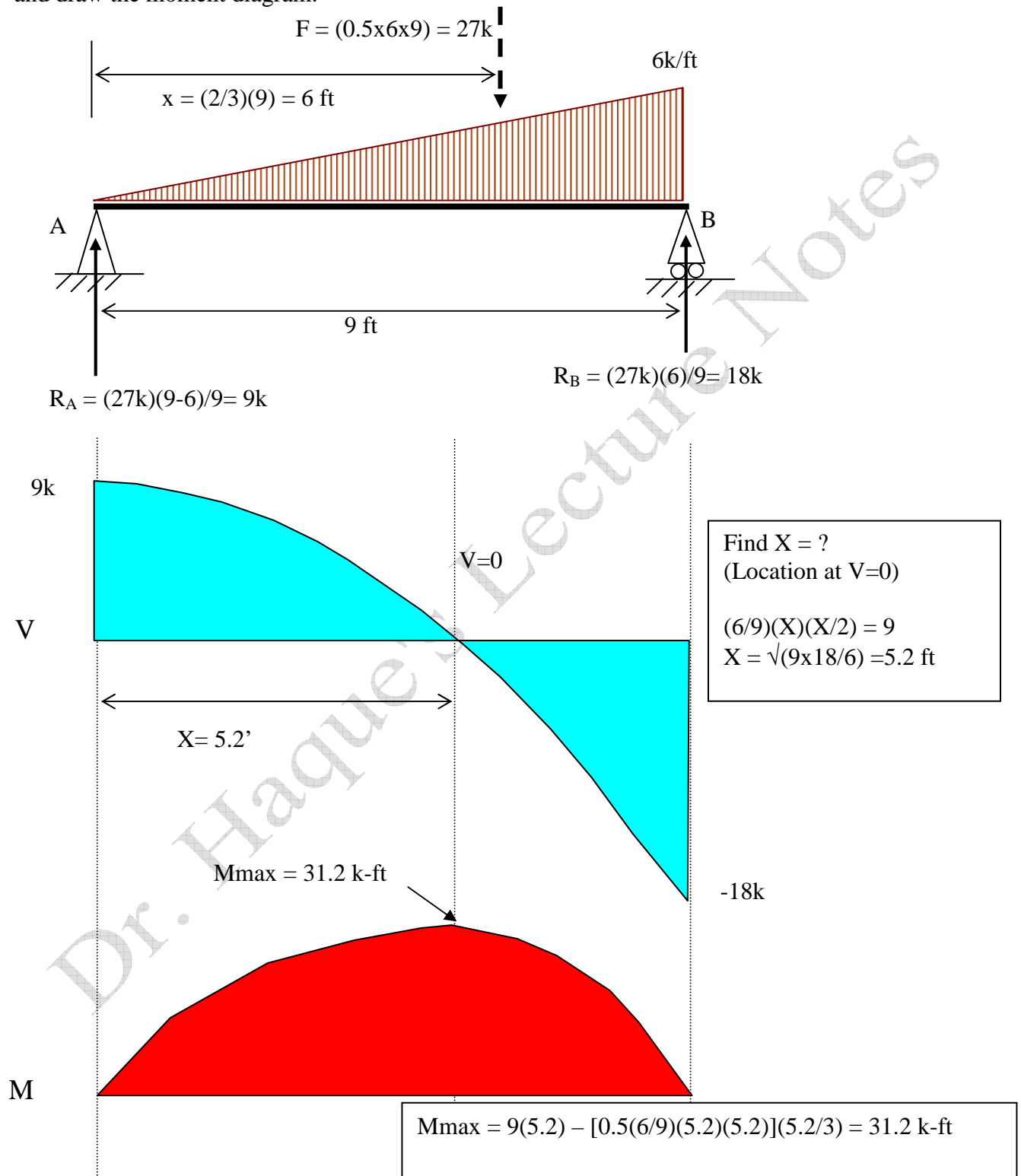
$$R_{bv} = 2 + (0.25 \times 10) = 4.5 \text{ k (up)}$$



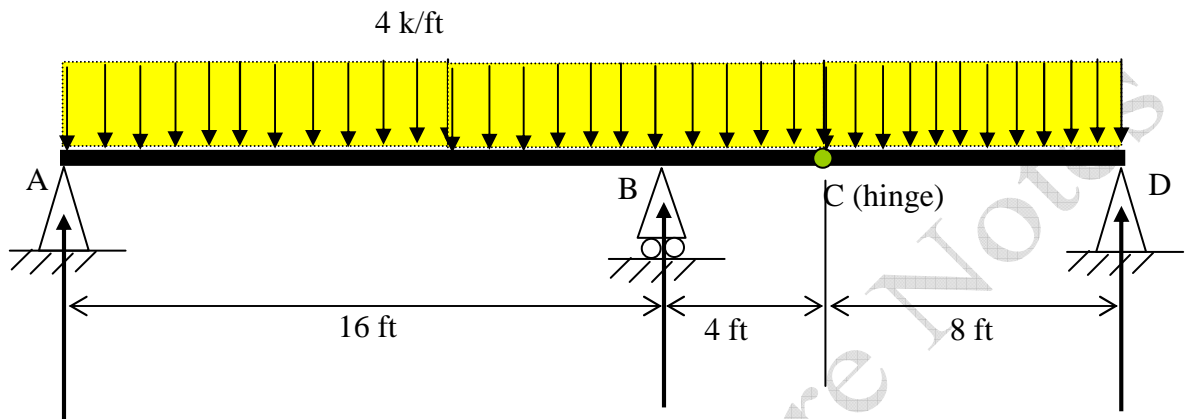
Q5: Calculate Reactions at A and B. Draw Shear Force Diagram. Find location of Zero Shear force. Find the Maximum Moment. Draw the Moment Diagram.



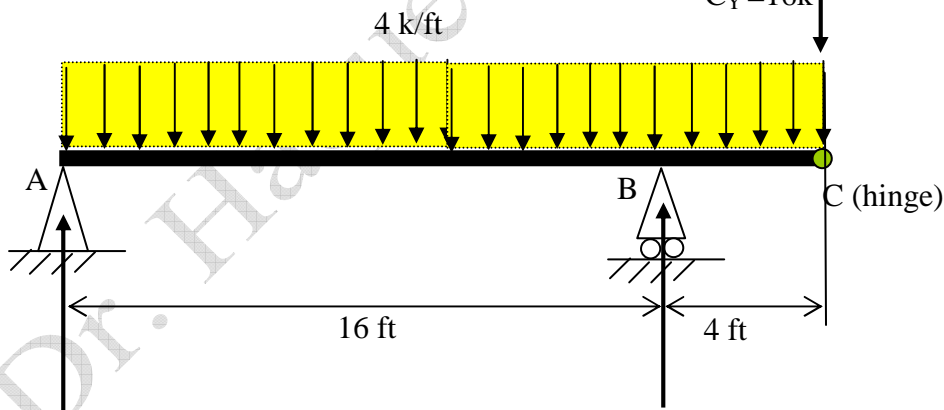
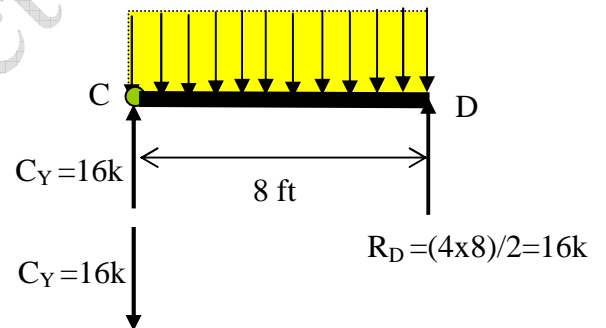
Q6: A simply supported beam with a triangularly distributed downward load is shown in Fig. Calculate reaction; draw shear force diagram; find location of $V=0$; calculate maximum moment, and draw the moment diagram.



Q7:

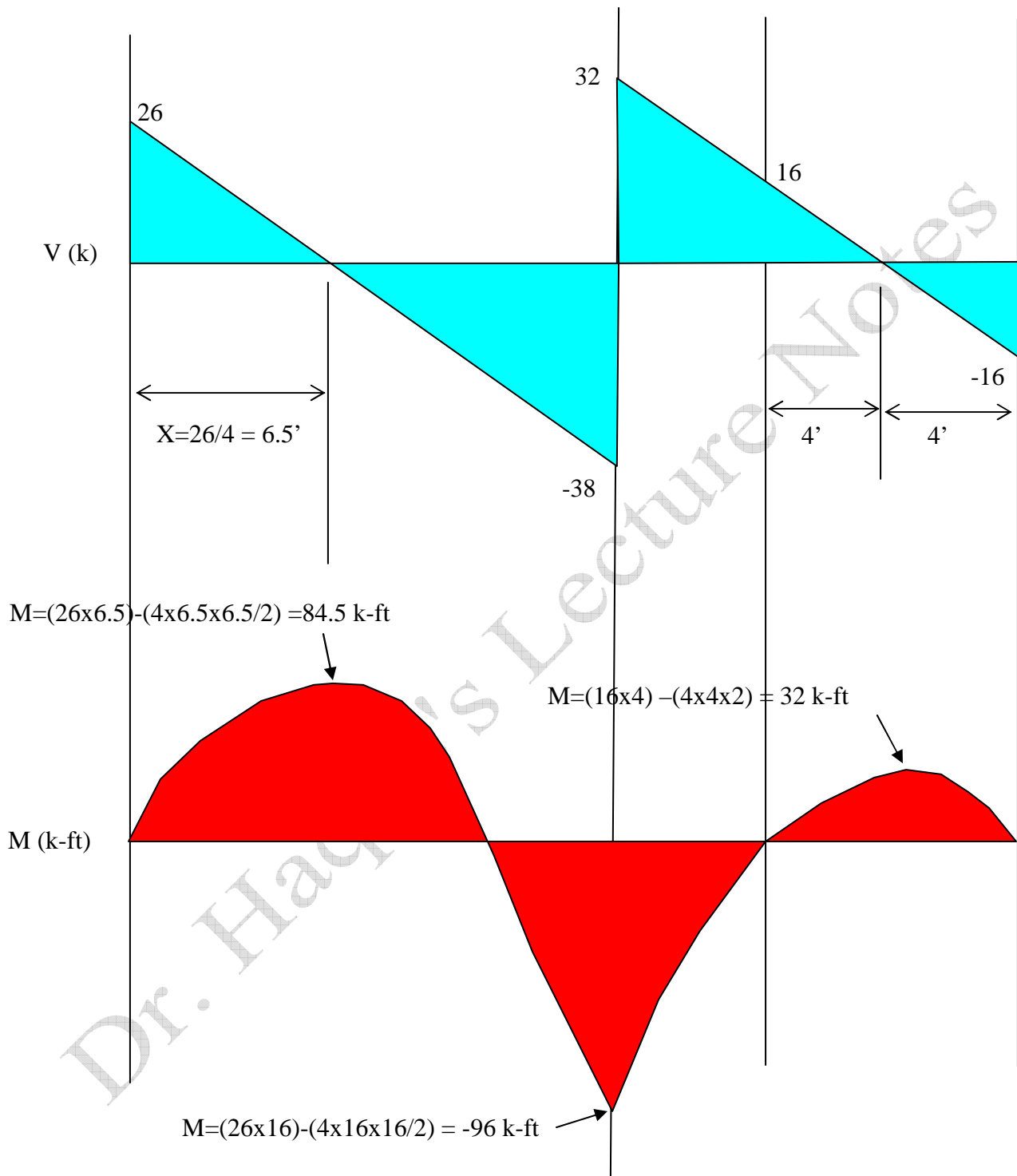


Calculate Reactions



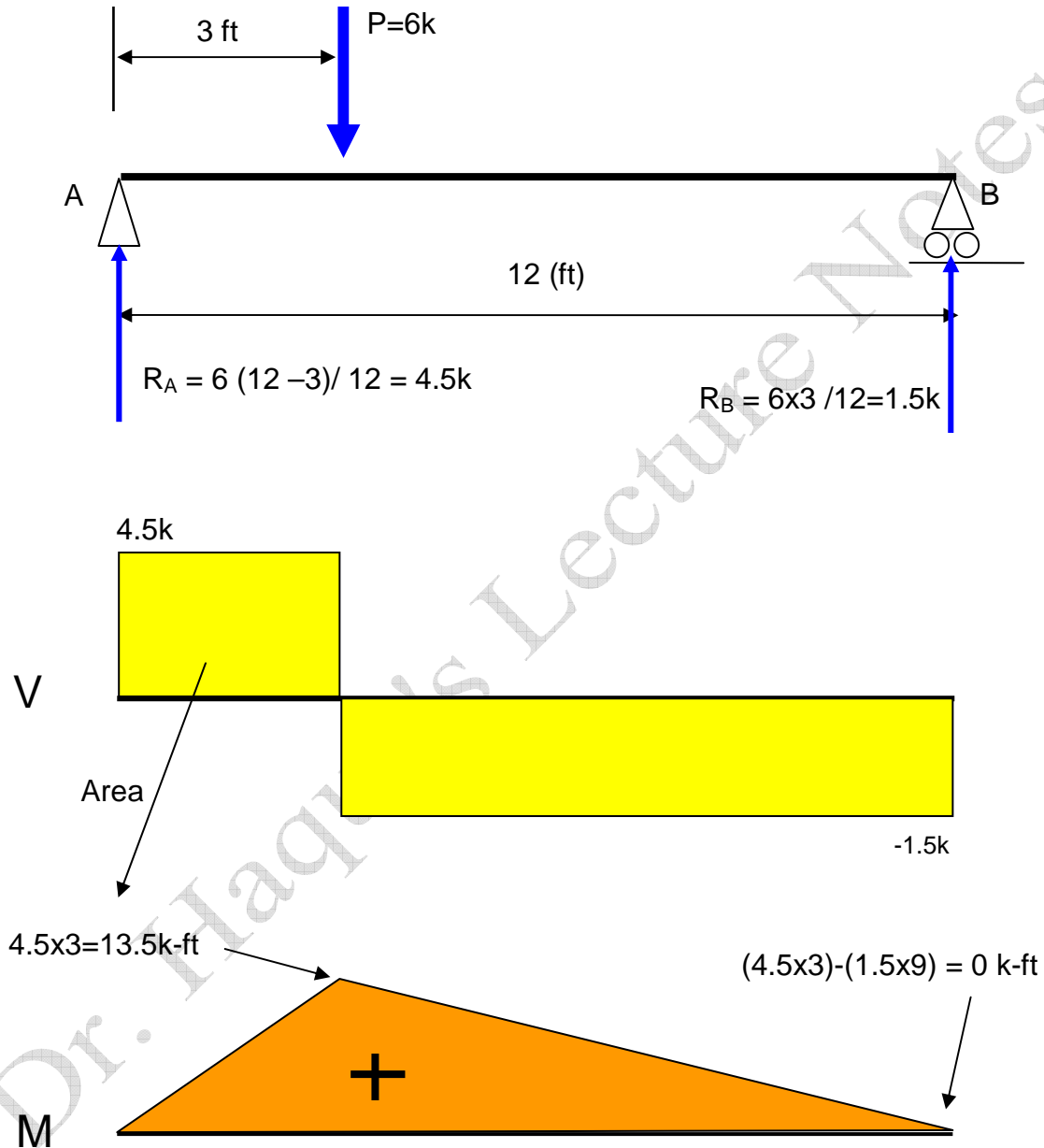
$$R_B = (4 \times 20) + 16 - 70 = 26 \text{ k}$$

$$R_B = [(4 \times 20 \times 10) + (16 \times 20)] / 16 = 70 \text{ k}$$

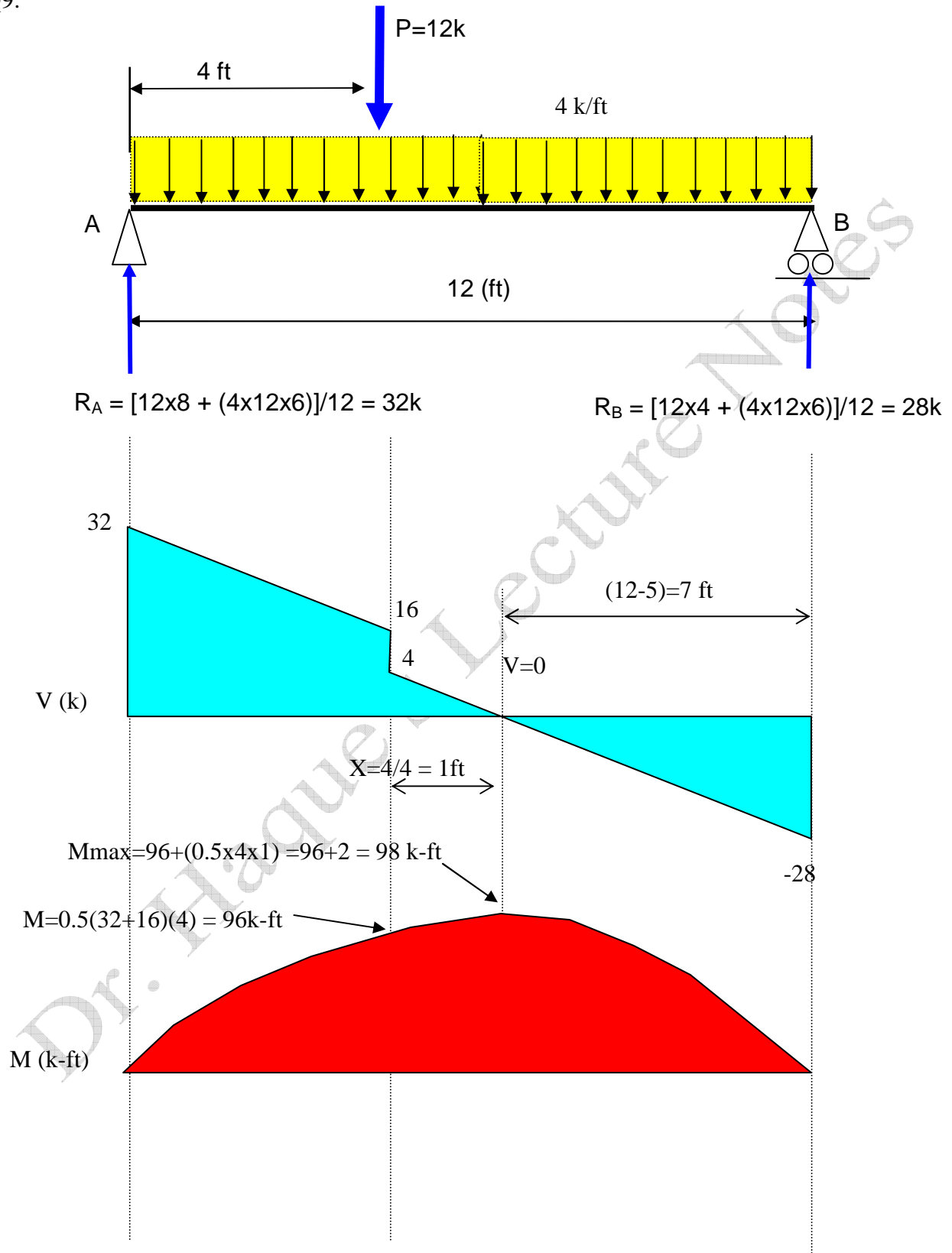


Semi-graphical Method for V and M Diagrams

Q8:



Q9:



Thank you.

Dr. Haque's Lecture Notes