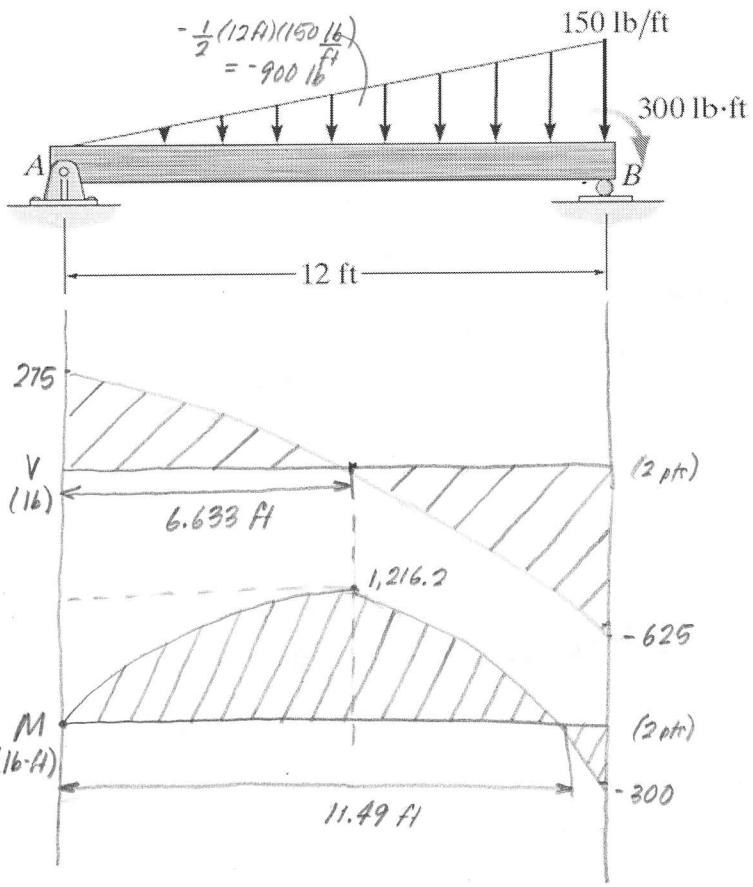
CME 260 – Mechanics of Materials
Exam #5 (03/20/2024)

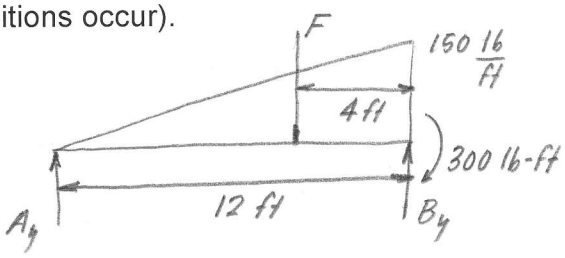
StarID or TechID (no names) Grading

Do one of the two problems shown below (the second problem is on the back).
Show your work (you will not receive any credit if all you have is a final answer, right or wrong).

1. Determine the internal shear and moment in the beam as a function of x (x begins at the pinned support A and increases to the right).
Draw the shear and moment diagrams. Make sure you provide the applicable values on the diagrams (at the beginning/end and where any positive/negative transitions occur).



(2 pts)
(2 pts)



$F = \frac{1}{2}(12\,ft)(150\,\frac{lb}{ft}) = 900\,lb$

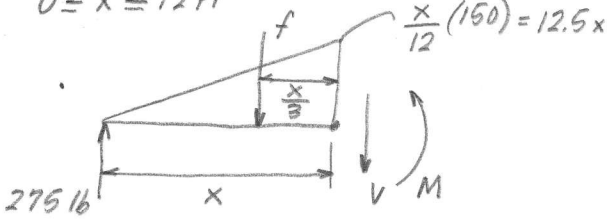
$\sum M_A = 0,\ -(900\,lb)(8\,ft) - 300\,lb\text{-}ft + B_y(12\,ft) = 0$

$B_y = 625\,lb$ (1 pt)

$\sum F_y = 0,\ A_y + 625\,lb - 900\,lb = 0$

$A_y = 275\,lb$ (1 pt)

$0 \le x \le 12\,ft$



$f = \frac{1}{2}x(12.5x) = 6.25x^2$ (lb)

$\sum F_y = 0,\ 275 - 6.25x^2 - V = 0$

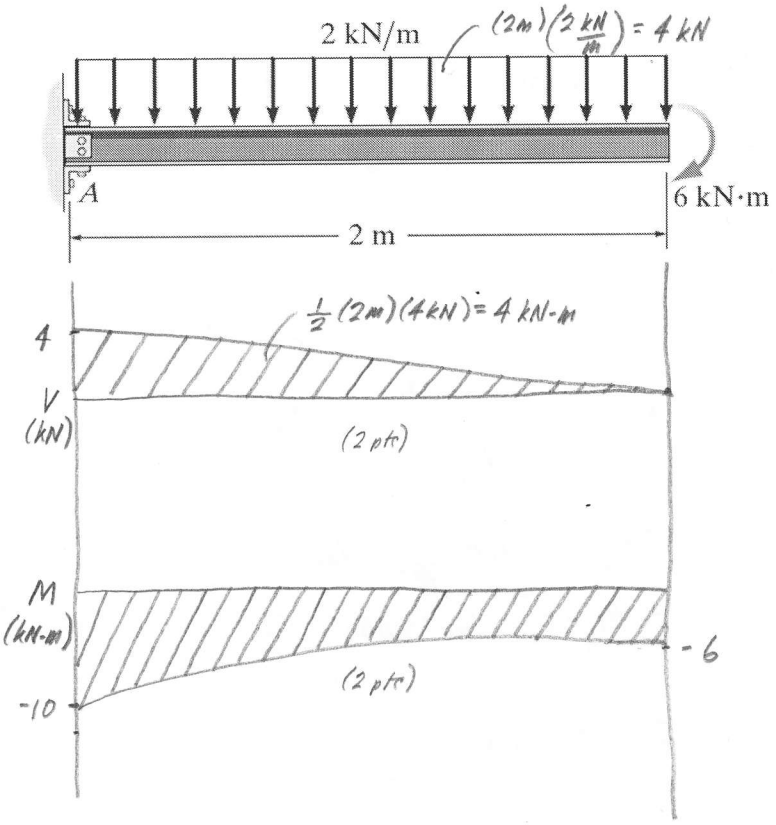
(2 pts) $\boxed{V = -6.25x^2 + 275\ (lb)}$

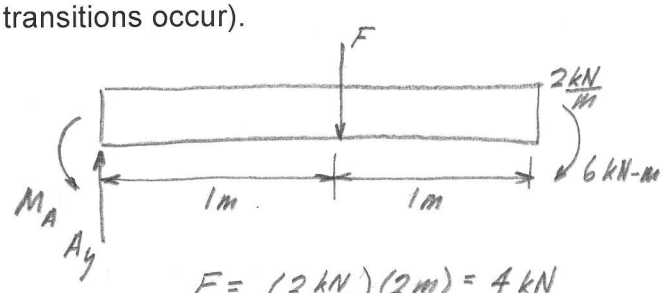
$\sum M_x = 0,\ -275x + (6.25x^2)\frac{x}{3} + M = 0$

$\boxed{M = -2.083x^3 + 275x\ (lb\text{-}ft)}$

(2 pts)

2. Determine the internal shear and moment in the beam as a function of x (x begins at the fixed support A and increases to the right).
Draw the shear and moment diagrams. Make sure you provide the applicable values on the diagrams (at the beginning/end and where any positive/negative transitions occur).





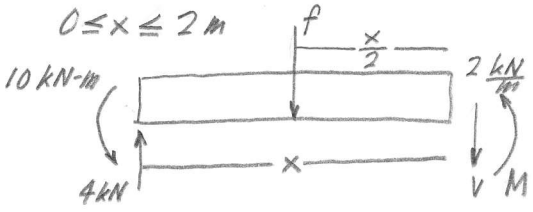
$F = (2\frac{kN}{m})(2m) = 4\,kN$

$\Sigma M_A = 0,\ -(4kN)(1m) - 6\,kN\text{-}m + M_A = 0$

$M_A = 10\,kN\text{-}m$ (1 pt)

$\Sigma F_y = 0,\ A_y - 4kN = 0$

$A_y = 4\,kN$ (1 pt)



$f = 2x\ (kN)$

$\Sigma F_y = 0,\ 4 - 2x - V = 0$

$\boxed{V = -2x + 4\ (kN)}$ (2 pts)

$\Sigma M_x = 0,\ 10 - 4x + (2x)(\frac{x}{2}) + M = 0$

$\boxed{M = -x^2 + 4x - 10\ (kN\text{-}m)}$

(2 pts)