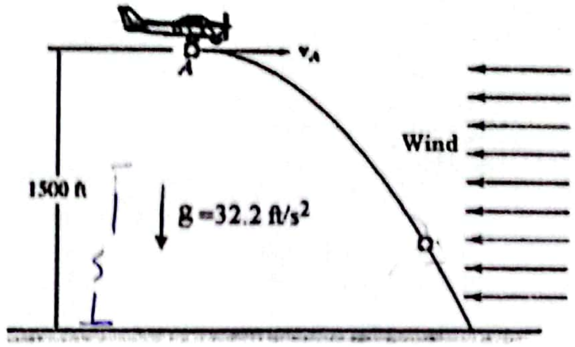
...em 4 (8 points) 3

...ckage is dropped from the plane at an altitude of 1500 ft with a constant horizontal velocity of $v_A = 150$ ft/s. ...wind imparts a horizontal acceleration of 3 ft/s^2 to the left. When the package is at an altitude of 500 ft from ...ground, determine:

a) The velocity of the package
b) The normal and tangential components of acceleration
c) The radius of curvature of the path of motion.



$v = v_0 + a t$

$s = s_0 + v_0 t + \frac{1}{2} a t^2$

$v^2 = v_0^2 + a \Delta s$

$V_a = \frac{ds}{dt} = 150$ ≠ Const

$\int_0^s ds = \int_0^t 150\, dt$??

$S = 150 t$ v_x y

when $s = 500$ ft

$\boxed{t = 3.33 \text{ s}}$

$\rho = \frac{\left(1 + (dy/dx)^2\right)^{3/2}}{\left| d^2y/dx^2 \right|} = \frac{\#}{0}$

$\rho = \infty$

$\boxed{A}$ ~~Constant acceleration~~

$\cancel{V = 150 +}$

$\cancel{V_x^2 = (150)^2 +}$

when $\boxed{s = 500}$

$V_x = 150 + (-3)(3.33)$

$\boxed{V_x = 140 \text{ ft/s}}$

$V_y = 0 + (-32.2)(3.33)$

$\boxed{V_y = -107.23 \text{ ft/s}}$

$\boxed{V = \sqrt{(140)^2 + (-107.23)^2} = 176.34 \text{ ft/s}}$

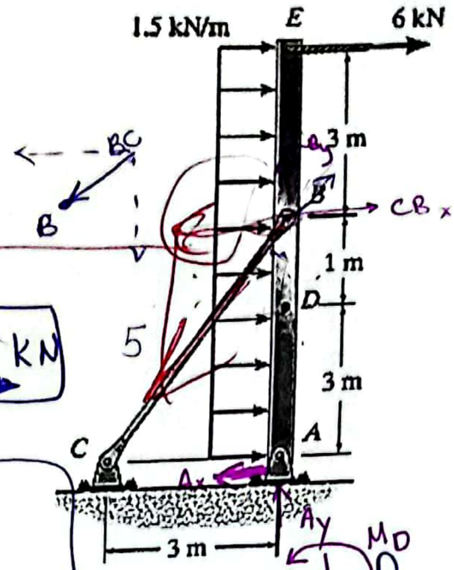
$a_t =$ -32.2 on y
-3 on x

$a_t = \sqrt{9 + (-32.2)^2} = \boxed{32.34 \text{ ft/s}^2}$

$\cancel{a_n = \frac{v^2}{\rho} = \frac{(176.34)^2}{\rho}}$

$\boxed{a_n = 0 \text{ ft/s}^2}$

blem 2. (6 points) 4
etermine the internal normal force, shear force, and moment at D.



$\Sigma F_x = 0$

$6 - A_x \mp BC\left(\frac{3}{5}\right) = 0$

$6 - A_x - 10.5 = 0 \Rightarrow \boxed{A_x = 4.5\ kN}$

5

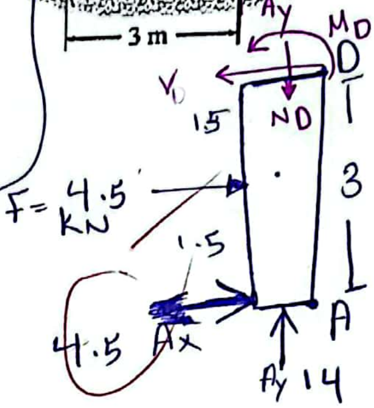
$\Sigma M_A = 0$ Distr. ?

$-CB_x(4) - 6(7) = 0$

$4CB_x = -42$

$\boxed{CB_x = -10.5}$

$\boxed{1.5(3) = 4.5\ kN}$



$10.5 = CB\ \frac{3}{5}$

$\boxed{CB = 17.5}$

$\Sigma F_y = 0$

$-CB_y + A_y = 0$

$-17.5\left(\frac{4}{5}\right) + A_y = 0$

$\boxed{A_y = 14\ KN \uparrow}$

$\Sigma F_y = 0$

$-N_D + 14 = 0$

$\boxed{N_D = 14\ KN}$

$\Sigma F_x = 0$

$4.5 + 4.5 - V_D = 0$

$\boxed{V_D = 9\ KN}$

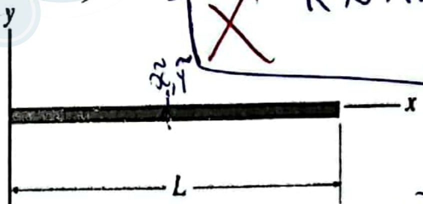
13.5 + 6.75

$\Sigma M_D = 0$

$4.5(1.5) + (4.5)(3) =$ $\boxed{M_D = 20.25\ KN.m}$

1.5

Problem 3. (4 points)
Find the center of mass of the straight rod (uniform cross-sectional area) if its mass density is given by: $\rho = \rho_o(1 - 0.5x/L)$, where ρ_o is constant.



$\rho = \rho_o\left(\frac{1 - 0.5x}{L}\right)$ Constant

$\bar{x} = \frac{\int \tilde{x}\, d\rho}{\int d\rho} = \frac{\int \frac{L}{2}\, d\rho}{\int d\rho} = \frac{\int \frac{L}{2}\left(\rho_o\left(\frac{1}{L} - \frac{0.5}{L}\right)\right) d\rho}{\int \rho_o\left(\frac{1}{L} - \frac{0.5}{L}\right) d\rho}$

$d\rho = \rho_o\left(\frac{1}{L} - \frac{0.5}{L}\right)$

$\boxed{\bar{y} = \frac{\int \tilde{y}\, d\rho}{\int d\rho} = 0}$

$\frac{\frac{L}{2}\rho_o\left(\frac{1}{L} - \frac{0.5}{L}\right)\rho}{\rho_o\left(\frac{1}{L} - \frac{0.5}{L}\right)\rho} = \boxed{\frac{L}{2} = \bar{x}}$

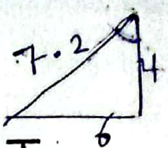
$\cancel{\bar{z} = \frac{\int \tilde{z}\, d\rho}{\int d\rho}}$

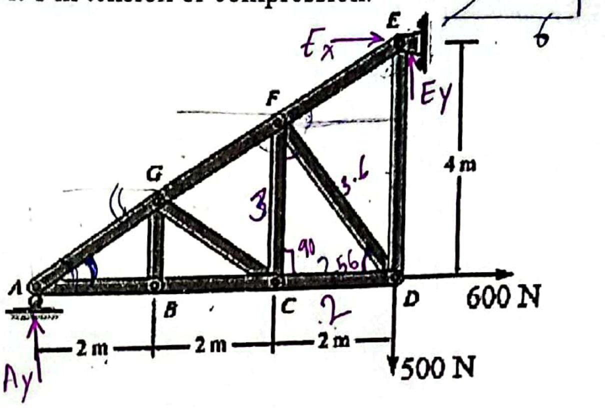
$d = \frac{m}{V}$ $\frac{m}{d} = \frac{m}{m/V}$ (V)

CamScanner

Problem 1. (7 points) 5.5 6

Determine the force in each member of the truss shown and state if it's in tension or compression.





$E_x = 600$ N ←

$E_y = 100$ N ↑

$A_y = 400$ N ↑

$EF = 721.1$ N (C)

$AG = 727.3$ N (C)

$AB = 606.1$ N (T)

$ED = 300.6$ N (T)

$GF = 727.3$ N (C)

$BG = 0$

$GC = 0$

$CF = 0$

$\Sigma F_x = 0$

$600 + E_x = 0 \Rightarrow E_x = -600$

$\boxed{E_x = 600 \text{ N} \leftarrow}$

$\Sigma M_E = 0$

$-A_y(6) + 600(4) = 0$

$A_y = \frac{600(4)}{6}$

$\boxed{A_y = 400 \text{ N} \uparrow}$

$\Sigma F_y = 0$

$E_y + 400 - 500 = 0$

$\boxed{E_y = 100 \text{ N} \uparrow}$

joint E

ED, 600, EF, 100

$\Sigma F_x = 0$

$-600 - EF\left(\frac{6}{7.2}\right) = 0$

$\cancel{0.83} EF = \frac{-600}{0.83}$

$EF = (-)\ 721.1$ N

$\boxed{EF = 721.1 \text{ N} \quad C}$

$\Sigma F_y = 0$

$100 - ED - EF\left(\frac{4}{7.2}\right) = 0$

$ED = 100 - 400.6$

$ED = -300.6$

$\boxed{ED = 300.6 \text{ N} \quad T}$

joint A

AG, AB, 400

$\Sigma F_y = 0$

$AG\left(\frac{4}{7.2}\right) + 400 = 0$

$AG = \frac{-400}{0.55} = -727.3$ N

$\boxed{AG = 727.3 \text{ N (C)}}$

$\Sigma F_x = 0$

$-AG\left(\frac{6}{7.2}\right) + AB = 0$

$\boxed{AB = 606.1 \text{ N} \quad T}$

$-600.9 \quad +606.1$

joint D

EF, GF, DF

DF, 300.6, 600, 500

$\Sigma F_x = 0$

~~600 DF~~

$-721.1\left(\frac{6}{7.2}\right) + (727.3)\left(\frac{6}{7.2}\right) + DF\left(\frac{2}{3.6}\right) = 0$

$\boxed{DF = -9.33 \text{ N} = 9.33 \text{ N} \quad C}$

joint G:

AG, GF

$\Sigma F_x = 0$

$(727.3)\left(\frac{6}{7.2}\right) + GF\left(\frac{6}{7.2}\right) = 0$

$GF = 727.3 \left(\frac{6}{7.2}\right)\left(\frac{7.2}{6}\right)$

$GF = -727.3$ N

$\boxed{727.3 \text{ N} \quad C}$