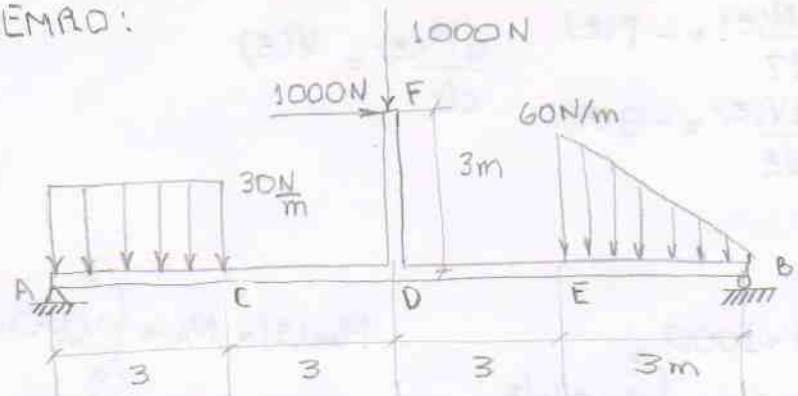
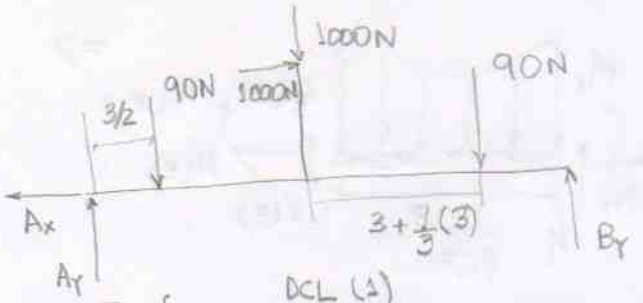
EJEMPLO:





DCL (1)

$\rightarrow \sum F_x = 0, \quad A_x = 1000\,N$

$+\uparrow \sum F_y = 0, \quad A_y + B_y = 90 + 1000 + 90$

$A_y + B_y = 1180$

$+\circlearrowleft \sum M_A^E = 0, \quad 90\left(\frac{3}{2}\right) + 1000(3) + 1000(6) + 90(4+6) = 12\,B_y$

$B_y = 836.25\,N$

$A_y = 343.75\,N$

PARA HALLAR N(z), V(z), M(z) EN EL TRAMO HORIZONTAL DE VIGA CONVIENE HACER EL CORTE AUXILIAR:

DCL (2)

$\rightarrow \sum F_x^E = 0, \quad V' = 1000\,N$

$+\uparrow \sum F_y^E = 0, \quad N' = 1000\,N$

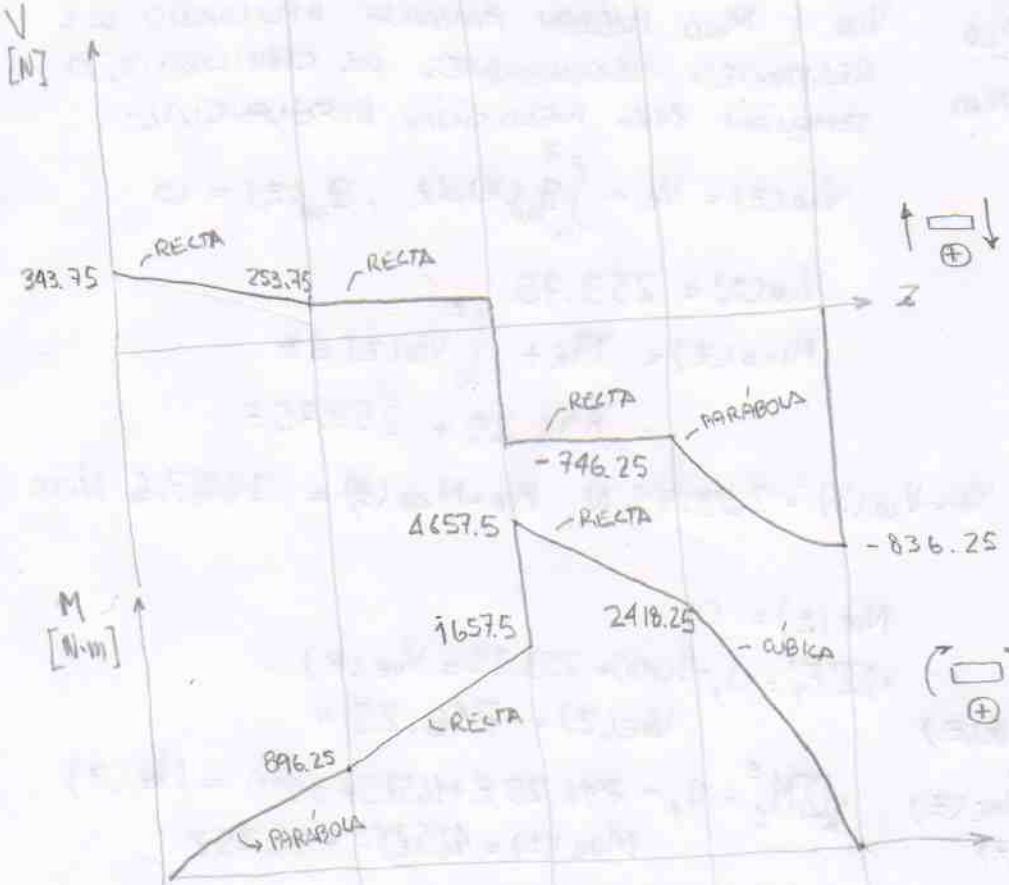
$+\circlearrowleft \sum M_D^E = 0, \quad 1000(3) = M'$

Así: $V'_D = 1000\,N$

$N'_D = 1000\,N$

$M'_D = 3000\,N$

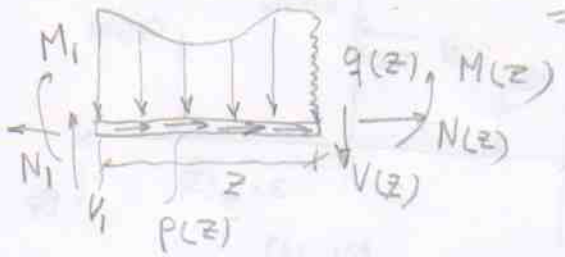
(SON FUERZAS INTERNAS QUE "TRANSMITE" DE A AB EN D)



PUNTO "CRÍTICO" BASADO EN MAGNITUDES DE FUERZAS INTERNAS

$Z = 6\,m$

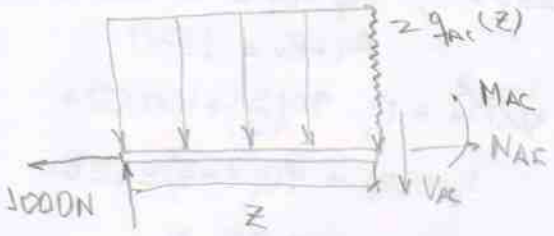
PARA LOS TRAMOS O SECCIONAMIENTOS ADICIONALES PUEDEN APLICARSE RELACIONES DIFERENCIALES.



$\Rightarrow \quad \frac{dN(z)}{dz} = -p(z) \qquad \frac{dM(z)}{dz} = V(z)$

$\frac{dV(z)}{dz} = -q(z)$

TRAMO AC:



343.75 N

$N_{AC}(z) = 1000$

$V_{AC} = V_A - \int_0^z q_{AC}(z)\,dz$

$V_{AC}(z) = 343.75 - \int_0^z 30\,dz$

$V_{AC}(z) = 343.75 - 30z$

$M_{AC}(z) = M_A + \int_0^z V_{AC}(z)\,dz$

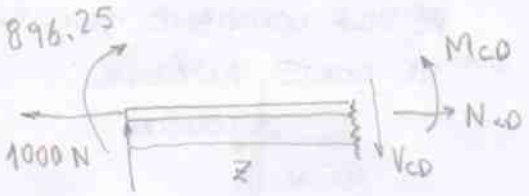
$M_{AC}(z) = 0 + \int_0^z (343.75 - 30z)\,dz$

$M_{AC}(z) = 343.75z - 15z^2$

EVALUANDO EN C: $N_C = 1000\ N$, $V_C = V_{AC}(3) = 253.75\ N$

$M_C = M_{AC}(3) = 896.25\ N\cdot m$

TRAMO CD:



253.75 N

$N_{CD}(z) = 1000\ N$

V_{CD} Y M_{CD} PUEDEN HALLARSE APLICANDO LAS RESTANTES ECUACIONES DE EQUILIBRIO, O TAMBIÉN POR RELACIÓN DIFERENCIAL:

$V_{CD}(z) = V_C - \int_0^z q_{CD}(z)\,dz \ , \ q_{CD}(z) = 0$

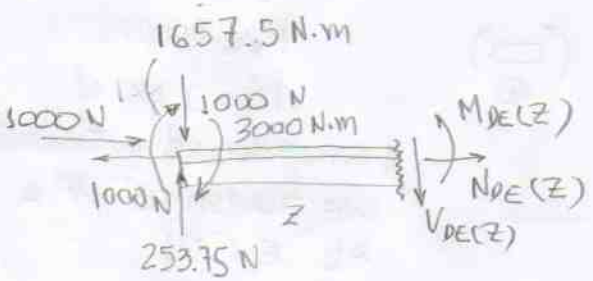
$V_{CD}(z) = 253.75$

$M_{CD}(z) = M_C + \int_0^z V_{CD}(z)\,dz$

$= 896.25 + 253.75z$

EVALUANDO $N_D = 1000N$, $V_D = V_{CD}(3) = 253.75\ N$, $M_D = M_{CD}(3) = 1657.5\ N.m$

TRAMO DE:



253.75 N

$N_{DE}(z) = 0$

$+\!\uparrow \sum F_y^E = 0, \quad -1000 + 253.75 = V_{DE}(z)$

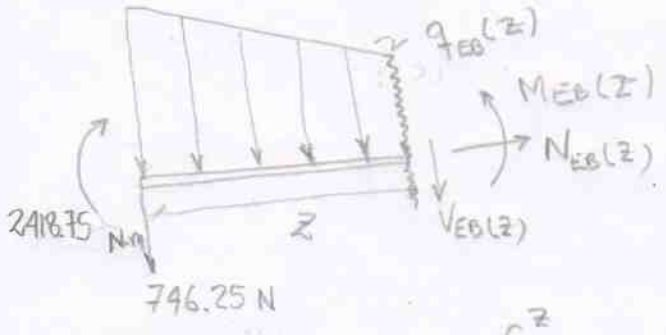
$V_{DE}(z) = -746.25$

$+\!\circlearrowleft \sum M_E^E = 0, \quad -746.25z + 1657.5 + 3000 = M_{DE}(z)$

$M_{DE}(z) = 4657.5 - 746.25z$

EVALUANDO: $N_E = 0$, $V_E = -746.25\ N$, $M_E = 2418.75\ N.m$

TRAMO EB



$N_{EB}(z) = 0$

$V_{EB}(z) = V_E - \int_0^z q_{EB}(z)\,dz$, $q_{EB}(z) = ?$

$\frac{60}{3} = \frac{q_{EB}(z)}{(3-z)} \Rightarrow q_{EB}(z) = 20(3-z)$

VERIFICANDO : $q_E = q_{EB}(0) = 60$ N/m

$q_B = q_{EB}(3) = 0$

$$V_{EB}(z) = -746.25 - \int_0^z 20(3-z)\,dz$$

$$V_{EB}(z) = -746.25 + 10\left[(3-z)^2\right]\Big|_0^z = -746.25 + 10(3-z)^2 - 90$$

$$V_{EB}(z) = -836.25 + 10(3-z)^2$$

$$M_{EB}(z) = M_E + \int_0^z V_{EB}(z)\,dz = 2418.75 + \int_0^z \left[-836.25 + 10(3-z)^2\right] dz$$

$$M_{EB}(z) = 2418.75 - 836.25z\Big|_0^z - \frac{10}{3}(3-z)^3\Big|_0^z$$

$$M_{EB}(z) = 2418.75 - 836.25z - \frac{10}{3}\left[(3-z)^3 - 27\right]$$

$$M_{EB}(z) = 2418.75 - 836.25z - \frac{10}{3}(3-z)^3 + 90$$

$$M_{EB}(z) = 2508.75 - 836.25z - \frac{10}{3}(3-z)^3$$

EVALUANDO :

$N_B = N_{EB}(3) = 0$

$V_B = V_{EB}(3) = -836.25$ N

$M_B = M_{EB}(3) = 0$ N.m

} POR EQUILIBRIO ESTÁTICO (ENTRE FUERZAS INTERNAS Y REACCIONES DE VINCULO) ESTE RESULTADO "ERA DE ESPERARSE".

DEBEN COINCIDIR CON REACCIONES EN ESTE PUNTO