PROBLEMAS RESUELTOS ESTATICA

CAPITULO 5 FUERZAS DISTRIBUIDAS
Tercera y quinta edicion
j. l. meriam – l.g. kraige

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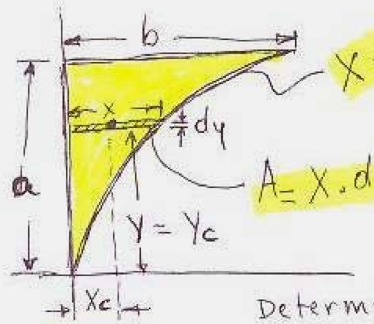
Problema 5.6 Estatica Meriam Edic. 3.

Hallar las coordenadas del centroide de la superficie sombreada.



Elemento diferencial horizontal

$X_c = \frac{x}{2}$

Determinacion de la Constante "K" en funcion de "a" y "b".

$X = K y^2$

$b = K (a)^2$

$x = b$
$y = a$

Despejamos K

$b = K a^2$

$$\boxed{K = \frac{b}{a^2}}$$

Se halla el area sombreada

$A = \int dA = \int_0^a x\, dy$

$A = x . dy$

Pero:

$X = K y^2$

$X = \left(\frac{b}{a^2}\right) y^2$

$A = \int_0^a \left(\frac{b}{a^2}\right) y^2 . dy$

$A = \frac{b}{a^2} \int_0^a y^2 dy$

$A = \frac{b}{a^2} \frac{(y)^3}{3} \Big|_0^a$

$A = \frac{b}{a^2} \frac{(a)^3}{3} - \cancel{\frac{b}{a^2} (0)^3} = \frac{b a^{\cancel{3}}}{3 \cancel{a^2}}$

$$\boxed{A = \frac{ba}{3}}$$ Area total

EQuintero

Hallar $\int X_c\, dA$

Pero $X_c = \frac{x}{2}$

$dA = x\, dy$

$\int X_c\, dA = \int_0^a \left(\frac{x}{2}\right)(x\, dy)$

$\int X_c\, dA = \int_0^a \frac{x^2}{2} dy = \frac{1}{2}\int_0^a x^2 dy$

Pero $x = K y^2$

$X = \left(\frac{b}{a^2}\right) y^2$

$$\boxed{X^2 = \frac{b^2}{a^4} . y^4}$$

$\int X_c\, dA = \frac{1}{2}\int_0^a x^2\, dy$

$\int X_c\, dA = \frac{1}{2}\int_0^a \left(\frac{b^2}{a^4} y^4\right) dy$

$\int X_c\, dA = \frac{1}{2} \frac{b^2}{a^4} \int_0^a y^4 dy$

$\int X_c\, dA = \frac{b^2}{2a^4} \frac{(y)^5}{5} \Big|_0^a$

$\int X_c\, dA = \frac{b^2}{2a^4} \frac{(a)^5}{5} - \cancel{\frac{b^2}{2a^4} \frac{(0)^5}{5}}$

$\int X_c\, dA = \frac{b^2 \cancel{a^5}}{10 \cancel{a^4}} = \frac{b^2 a}{10}$

$$\boxed{\int X_c\, dA = \frac{b^2 a}{10}}$$

Hallar $\int Y_c . dA$

Pero $y = Y_c$

$dA = x\, dy$

$\int Y_c\, dA = \int_0^a y (x\, dy)$

Pero $x = \left(\frac{b}{a^2}\right) y^2$

$\int Y_c\, dA = \int_0^a y \left(\frac{b}{a^2}\right) y^2 dy$

$$\int y_c\, dA = \frac{b}{a^2}\int_0^a y^3\, dy$$

$$\int y_c\, dA = \frac{b}{a^2}\,\frac{(y)^4}{4}\Big|_0^a$$

$$\int y_c\, dA = \frac{b}{a^2}\,\frac{(a)^4}{4} - \cancel{\frac{b}{a^2}\,\frac{(0)^4}{4}}^{\,0}$$

$$\int y_c\, dA = \frac{b\,\cancel{a^4}}{4\cancel{a^2}} = \frac{a^2 b}{4}$$

$$\boxed{\int y_c\, dA = \frac{a^2 b}{4}}$$

$$\bar{X} = \frac{\int X_c\, dA}{A} = \frac{\frac{b^2 a}{10}}{\frac{ba}{3}} = \frac{3(b^{\cancel{2}}\cancel{a})}{10(\cancel{ba})}$$

$$\boxed{\bar{X} = \frac{3}{10}\,b}$$

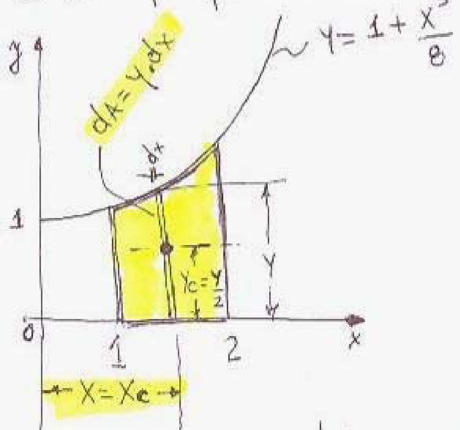
$$\bar{Y} = \frac{\int y_c\, dA}{A} = \frac{\frac{a^2 b}{4}}{\frac{ba}{3}}$$

$$\bar{Y} = \frac{3(a^{\cancel{2}}\cancel{b})}{4(\cancel{ba})} = \frac{3}{4}\,a$$

$$\boxed{\bar{Y} = \frac{3}{4}\,a}$$

Problema 5.6 Estatica Meriam edic 5

Hallar las coordenadas del Centroide de la superficie sombreada.



Se halla el area total sombreada

$d_A = y\,dx$ Pero $\boxed{y = 1 + \frac{x^3}{8}}$

$A = \int d_A \quad \int_1^2 y\,dx$

$A = \int_1^2 \left[1 + \frac{x^3}{8}\right] dx = \int_1^2 dx + \int_1^2 \frac{x^3}{8} dx$

$A = x\Big|_1^2 + \frac{1}{8}\frac{x^4}{4}\Big|_1^2 = x\Big|_1^2 + \frac{x^4}{32}\Big|_1^2$

$A = 2 - 1 + \frac{(2)^4}{32} - \frac{(1)^4}{32}$

$A = 2 - 1 + \frac{16}{32} - \frac{1}{32} = 1 + \frac{15}{32}$

$A = \frac{32}{32} + \frac{15}{32} = \frac{47}{32}$

$\boxed{A = \frac{47}{32}}$ **Area total**

Hallar $\int x_c\, d_A$

Se observa en la figura que

$x = x_c \qquad d_A = y\,dx$

$\int x_c\, d_A = \int_1^2 (x)(y\,dx)$

$\boxed{\text{Pero} \quad y = 1 + \frac{x^3}{8}}$

$\int x_c\, d_A = \int_1^2 (x)\left(1 + \frac{x^3}{8}\right) dx$

$\int x_c\, d_A = \int_1^2 \left[x + \frac{x^4}{8}\right] dx$

$\int x_c\, d_A = \int_1^2 x\,dx + \int_1^2 \frac{x^4}{8} dx$

$\int x_c\, d_A = \frac{x^2}{2}\Big|_1^2 + \frac{x^5}{8(5)}\Big|_1^2$

$\int x_c\, d_A = \frac{x^2}{2}\Big|_1^2 + \frac{1}{40}x^5\Big|_1^2$

$\int x_c\, d_A = \frac{1}{2}(2)^2 - \frac{1}{2}(1)^2 + \frac{1}{40}(2)^5 - \frac{1}{40}(1)^5$

$\int x_c\, d_A = \frac{1}{2}(4) - \frac{1}{2} + \frac{32}{40} - \frac{1}{40}$

$\int x_c\, d_A = 2 - \frac{1}{2} + \frac{32}{40} - \frac{1}{40}$

$\int x_c\, d_A = \frac{80}{40} - \frac{20}{40} + \frac{32}{40} - \frac{1}{40} = \frac{91}{40}$

$\boxed{\int x_c\, d_A = \frac{91}{40}}$

Hallar $\int y_c\, d_A$. Pero $y_c = \frac{y}{2}$

$\int y_c\, d_A = \int_1^2 \left(\frac{y}{2}\right)(y\,dx) \qquad d_A = y\,dx$

$\int y_c\, d_A = \int_1^2 \frac{y^2}{2} dx$

$\int y_c\, d_A = \frac{1}{2}\int_1^2 (y^2)\,dx$

$\int y_c\, d_A = \frac{1}{2}\int_1^2 \left[1 + \frac{x^3}{4} + \frac{x^6}{64}\right] dx$

Pero

$y = 1 + \frac{x^3}{8}$

$y^2 = \left[1 + \frac{x^3}{8}\right]^2$

$y^2 = 1 + (2)\left(\frac{x^3}{8}\right) + \left(\frac{x^3}{8}\right)^2$

$\boxed{y^2 = 1 + \frac{x^3}{4} + \frac{x^6}{64}}$

continúa

$$\int y_c\, dA = \frac{1}{2}\int_1^2 \left(1 + \frac{x^3}{4} + \frac{x^6}{64}\right) dx$$

$$\int y_c\, dA = \frac{1}{2}\int_1^2 dx + \frac{1}{2}\int_1^2 \frac{x^3}{4} dx + \frac{1}{2}\int_1^2 \frac{x^6}{64} dx$$

$$\int y_c\, dA = \frac{1}{2}\int_1^2 dx + \frac{1}{8}\int_1^2 x^3 dx + \frac{1}{128}\int_1^2 x^6 dx$$

$$\int y_c\, dA = \frac{1}{2} x \Big|_1^2 + \frac{1}{8}\frac{(x)^4}{4}\Big|_1^2 + \frac{1}{128}\frac{(x)^7}{7}\Big|_1^2$$

$$\int y_c\, dA = \cancel{\frac{1}{2}}\cancel{(2)} - \frac{1}{2}(1) + \frac{1}{8}\frac{(2)^4}{4} - \frac{1}{8}\frac{(1)^4}{4} + \cancel{\frac{1}{128}}\cancel{\frac{(2)^7}{7}} - \frac{1}{128}\frac{(1)^7}{7}$$

$$\int y_c\, dA = 1 - \frac{1}{2} + \cancel{\frac{16}{32}} - \cancel{\frac{1}{32}} + \frac{1}{7} - \frac{1}{896}$$

$$\int y_c\, dA = 1 - \frac{1}{2} + \frac{15}{32} + \frac{1}{7} - \frac{1}{896} = \frac{995}{896}$$

$$\boxed{\int y_c\, dA = \frac{995}{896}}$$

$$\bar{X} = \frac{\int X_c\, dA}{A} = \frac{\frac{91}{40}}{\frac{47}{32}} = \frac{91(32)}{40(47)}$$

$$\bar{X} = \frac{2912}{1880} = 1{,}548$$

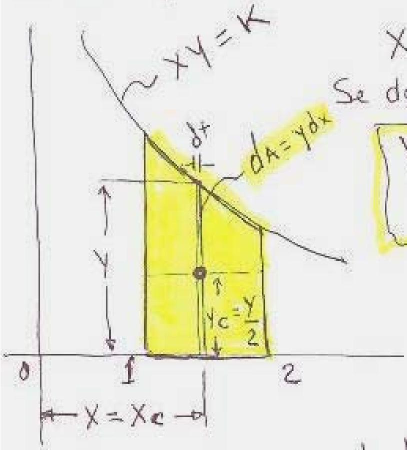
$$\boxed{\bar{X} = 1{,}548}$$

$$\bar{Y} = \frac{\int y_c\, dA}{A} = \frac{\frac{995}{896}}{\frac{47}{32}}$$

$$\bar{Y} = \frac{995(32)}{896(47)} = \frac{31840}{42112}$$

$$\boxed{\bar{Y} = 0{,}756}$$

Problema 5.9 Meriam edic 3.
Hallar las coordenadas del centroide de la superficie sombreada.



$X \cdot Y = K$

Se despeja "y"

$$\boxed{Y = \frac{K}{X}}$$

Se halla el area total.

$d_A = y\,dx$ Pero $y = \frac{K}{x}$

$$A = \int d_A \int_1^2 y\,dx$$

$$A = \int d_A = \int_1^2 \left(\frac{K}{x}\right) dx$$

$$A = \int d_A = K\int_1^2 \frac{dx}{dx}$$

$$A = K \ln x \Big|_1^2$$

$$A = K\ln(2) - \cancel{K\ln(1)}^{\,0}$$

$$\boxed{A = K \ln 2}$$ Area total

Se halla $\int x_c\, d_A$

Pero $X = x_c$

$d_A = y \cdot dx$

$$\boxed{\text{Pero } y = \frac{K}{x}}$$

$$\int x_c\, d_A = \int_1^2 X(y\,dx)$$

$$\int x_c\, d_A = \int_1^2 \cancel{X}\left(\frac{K}{\cancel{X}}\right) dx$$

$$\int x_c\, d_A = \int_1^2 K\,dx$$

$$\int x_c\, d_A = K\int_1^2 dx$$

$$\int x_c\, d_A = KX\Big|_1^2$$

$$\int x_c\, d_A = K(2) - K(1)$$

$$\boxed{\int x_c\, d_A = K}$$

Se halla $\int y_c\, d_A$ Pero

$d_A = y\,dx$ $y_c = \frac{y}{2}$

$$\int y_c\, d_A = \int_1^2 \left(\frac{y}{2}\right)(y\,dx)$$

$$\int y_c\, d_A = \int_1^2 \frac{y^2}{2}\,dx = \frac{1}{2}\int_1^2 y^2\,dx$$

Pero $y = \frac{K}{x} = \boxed{y^2 = \frac{K^2}{x^2}}$

$$\int y_c\, d_A = \frac{1}{2}\int_1^2 \left(\frac{K^2}{x^2}\right) dx$$

$$\int y_c\, d_A = \frac{K^2}{2}\int_1^2 \frac{dx}{x^2} = \frac{K^2}{2}\int_1^2 x^{-2}\,dx$$

$$\int y_c\, d_A = \frac{K^2}{2}\,\frac{(x)^{-2+1}}{-2+1}\Big|_1^2$$

$$\int y_c\, d_A = \frac{K^2}{2}\,\frac{x^{-1}}{-1}\Big|_1^2 = -\frac{K^2}{2}\left(\frac{1}{x}\right)\Big|_1^2$$

$$\int y_c\, d_A = -\frac{K^2}{2}\left(\frac{1}{2}\right) - \left[-\frac{K^2}{2}\left(\frac{1}{1}\right)\right]$$

$$\int y_c\, d_A = -\frac{K^2}{4} + \frac{K^2}{2} = \frac{-K^2}{4} + \frac{2K^2}{4}$$

$$\boxed{\int y_c\, d_A = \frac{1}{4}K^2}$$

$$\bar{X} = \frac{\int x_c \, dA}{A} = \frac{\cancel{K}}{\cancel{K} \ln 2} = \frac{1}{\ln 2}$$

$$\bar{X} = \frac{1}{0{,}6931} = 1{,}442$$

$$\boxed{\bar{X} = 1{,}442}$$

$$\bar{Y} = \frac{\int y_c \, dA}{A} = \frac{\frac{K^2}{4}}{K \ln 2}$$

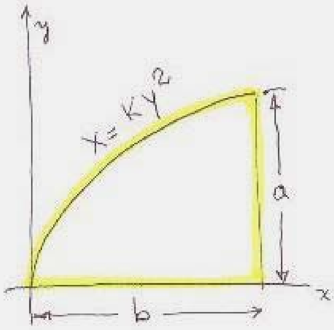
$$\bar{Y} = \frac{\cancel{K^2}}{4 \cancel{K} \ln 2} = \frac{K}{4 \ln 2}$$

$$\bar{Y} = \frac{K}{4(0{,}6931)} = \frac{K}{2{,}7725}$$

$$\boxed{\bar{Y} = 0{,}36 \, K}$$

Problema 5.10 Estatica Meriam Edic. 5

Hallar las coordenadas del centroide de la superficie sombreada.



Determinacion de la constante K.

Se halla la constante "K" en funcion de "a" y "b"

$X = K\,Y^2$ $\quad x = b$, $\quad y = a$

$b = k\,a^2$

Despejamos "K" $\quad b = k\,a^2$

$$\boxed{K = \frac{b}{a^2}}$$

$X = K\,y^2$

$$\boxed{X = \left(\frac{b}{a^2}\right) y^2}$$

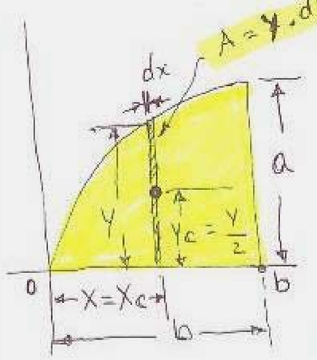
Despejamos "y"

$$\boxed{\frac{a^2}{b} \cdot X = y^2}$$

$$y = \sqrt{\frac{a^2 x}{b}} = a\sqrt{\frac{x}{b}}$$

$$\boxed{y = \frac{a\,x^{1/2}}{b^{1/2}}}$$

Elemento diferencial vertical



Se halla el area total de la figura.

$$A = \int dA = \int_0^b y \cdot dx$$

Pero: $y = \frac{a}{b^{1/2}} \cdot x^{1/2}$

$$A = \int dA = \int_0^b \left(\frac{a}{b^{1/2}} x^{1/2}\right) \cdot dx$$

$$A = \frac{a}{b^{1/2}} \int_0^b x^{1/2} dx$$

$$A = \frac{a}{b^{1/2}} \left.\frac{(x)^{1/2+1}}{1/2+1}\right|_0^b$$

$$A = \frac{a}{b^{1/2}} \left.\frac{x^{3/2}}{3/2}\right|_0^b = \frac{a}{b^{1/2}}\left(\frac{2}{3}\right) \left. x^{3/2} \right|_0^b$$

$$A = \frac{a}{b^{1/2}}\left(\frac{2}{3}\right)(b)^{3/2} - \cancel{\frac{a}{b^{1/2}}\left(\frac{2}{3}\right)(0)^{3/2}}$$

$$A = \frac{2}{3}\left(\frac{a}{b^{1/2}}\right)(b)^{3/2} = \frac{2}{3}\,a\,b^{3/2} \cdot b^{-1/2}$$

$$\boxed{A = \frac{2}{3}\,a\,b}$$ Area total

Hallar $\int X_c \cdot dA$.

En la figura se observa que $X = X_c$

$dA = y \cdot dx$ $\quad$ Pero $y = \frac{a}{b^{1/2}} \cdot x^{1/2}$

$$\int X_c \cdot dA = \int_0^b x\,(y\,dx)$$

$$\int X_c \cdot dA = \int_0^b x \left(\frac{a}{b^{1/2}} x^{1/2}\right) dx$$

$$\int X_c\, dA = \frac{a}{b^{1/2}} \int_0^b (x) x^{1/2} dx = \frac{a}{b^{1/2}} \int_0^b x^{3/2} \cdot dx$$

$$\int X_c\, dA = \frac{a}{b^{1/2}} \left.\frac{(x)^{3/2+1}}{3/2+1}\right|_0^b = \frac{a}{b^{1/2}} \left.\frac{x^{5/2}}{5/2}\right|_0^b$$

$$\int x_c\, d_A = \frac{a}{b^{1/2}}\left(\frac{2}{5}\right) x^{5/2}\Big|_0^b$$

$$\int x_c\, d_A = \frac{a}{b^{1/2}}\left(\frac{2}{5}\right)(b)^{5/2} - \cancel{\frac{a}{b^{1/2}}\left(\frac{2}{5}\right)(0)^{5/2}}^{\,0}$$

$$\int x_c\, d_A = \frac{a}{b^{1/2}}\left(\frac{2}{5}\right) b^{5/2} = \frac{2}{5}\, a \cdot b^{5/2} \cdot b^{-1/2}$$

$$\boxed{\int x_c\, d_A = \frac{2}{5}\, a\, b^2}$$

Se halla $\int y_c \cdot d_A$

En la figura anterior se observa que:

$$y_c = \frac{y}{2} \qquad \boxed{d_A = y \cdot dx}$$

$$\int y_c\, d_A = \int_0^b \frac{y}{2}(y \cdot dx) = \frac{1}{2}\int_0^b y^2\, dx$$

Pero: $y^2 = \frac{a^2}{b} \cdot x$

$$\int y_c\, d_A = \frac{1}{2}\int_0^b \left[\frac{a^2}{b} \cdot x\right] \cdot dx$$

$$\int y_c\, d_A = \frac{1}{2}\frac{a^2}{b}\int_0^b x\, dx = \frac{1}{2}\frac{a^2}{b}\frac{(x)^2}{2}\Big|_0^b$$

$$\int y_c\, d_A = \frac{1}{4}\frac{a^2}{b} x^2\Big|_0^b$$

$$\int y_c\, d_A = \frac{1}{4}\frac{a^2}{b}(b)^2 - \cancel{\frac{1}{4}\frac{a^2}{b}(0)^2}^{\,0}$$

$$\int y_c\, d_A = \frac{1}{4}\frac{a^2}{\cancel{b}} \cdot \cancel{b^2} = \frac{1}{4} a^2 \cdot b$$

$$\boxed{\int y_c\, d_A = \frac{1}{4} a^2 b}$$

$$\bar{X} = \frac{\int x_c \cdot d_A}{A} = \frac{\frac{2ab^2}{5}}{\frac{2ab}{3}}$$

$$\bar{X} = \frac{3(\cancel{2ab^2})}{5(\cancel{2ab})} = \frac{3b}{5}$$

$$\boxed{\bar{X} = \frac{3}{5} b}$$

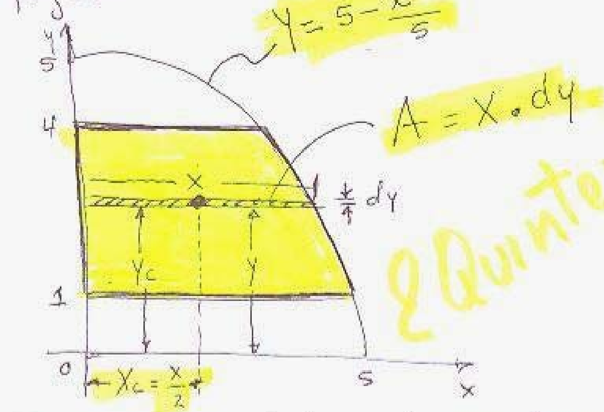
$$\bar{Y} = \frac{\int Y_c \cdot d_A}{A} = \frac{\frac{a^2 b}{4}}{\frac{2ab}{3}}$$

$$\bar{Y} = \frac{3(\cancel{a^2 b})}{4(\cancel{2ab})} = \frac{3a}{8}$$

$$\boxed{\bar{Y} = \frac{3}{8} a}$$

Problema 5.13 MERIAM EDIC 3

Localizar el centroide de la superficie sombreada de la figura



Hallamos el area de la parte sombreada por diferencial horizontal.

$$A = \int dA = \int_1^4 x\, dy$$

Pero $A = x \cdot dy$

$Y = 5 - \frac{x^2}{5}$

despejamos "x"

$\frac{x^2}{5} = 5 - y$

$x^2 = 5(5-y)$

$\boxed{x = \sqrt{5}\left(\sqrt{5-y}\right)}$

$$A = \int_1^4 \sqrt{5}\left(\sqrt{5-y}\right) dy$$

$$A = \sqrt{5}\int_1^4 \left(\sqrt{5-y}\right) dy$$

$$A = \sqrt{5}\int_1^4 (5-y)^{1/2}\, dy$$

cambio de variable

$\mu = 5 - y$

$d\mu = -dy$

$-d\mu = dy$

$$A = \sqrt{5}\int_1^4 (\mu)^{1/2}(-d\mu)$$

$$A = -\sqrt{5}\int_1^4 \mu^{1/2} = -\sqrt{5}\,\frac{(\mu)^{1/2+1}}{1/2+1}\Big|_1^4$$

$$A = -\sqrt{5}\,\frac{(\mu)^{3/2}}{3/2}\Big|_1^4 = -\sqrt{5}\left(\frac{2}{3}\right)(\mu)^{3/2}\Big|_1^4$$

$$A = -\frac{2\sqrt{5}}{3}(5-y)^{3/2}\Big|_1^4$$

$$A = -\frac{2\sqrt{5}}{3}(5-4)^{3/2} + \frac{2\sqrt{5}}{3}(5-1)^{3/2}$$

$$A = -\frac{2\sqrt{5}}{3}(1)^{3/2} + \frac{2\sqrt{5}}{3}(4)^{3/2}$$

$$A = -\frac{2\sqrt{5}}{3} + \frac{2\sqrt{5}}{3}(8)$$

$$A = -\frac{2\sqrt{5}}{3} + \frac{16\sqrt{5}}{3} = \frac{14\sqrt{5}}{3}$$

$\boxed{A = \frac{14\sqrt{5}}{3}}$ Area total

Hallar $\int X_c\, dA$

Pero $X_c = \frac{x}{2}$

$dA = x \cdot dy$

$$\int X_c\, dA = \int_1^4 \left(\frac{x}{2}\right)(x\, dy)$$

$$\int X_c\, dA = \frac{1}{2}\int_1^4 x\,(x\, dy) = \frac{1}{2}\int_1^4 x^2\, dy$$

Pero $x = \left(\sqrt{5}\right)\left(\sqrt{5-y}\right)$

$x^2 = (5)(5-y)$

$$\int X_c\, dA = \frac{1}{2}\int_1^4 x^2\, dy = \frac{1}{2}\int_1^4 (5)(5-y)\, dy$$

$$\int X_c\, dA = \frac{5}{2}\int_1^4 (5-y)\, dy$$

Pero $\mu = 5 - y$

$d\mu = -dy$

$-d\mu = dy$

$$\int X_c\, dA = \frac{5}{2}\int_1^4 (\mu)(-d\mu)$$

$$\int X_c\, dA = -\frac{5}{2}\int_1^4 \mu\, d\mu = -\frac{5}{2}\,\frac{\mu^2}{2}\Big|_1^4$$

$$\int X_c\, dA = -\frac{5}{4}\mu^2\Big|_1^4 = -\frac{5}{4}(5-y)^2\Big|_1^4$$

$$\int X_c\, dA = -\frac{5}{4}(5-4)^2 + \frac{5}{4}(5-1)^2$$

$$\int X_c\, dA = -\frac{5}{4}(1)^2 + \frac{5}{4}(4)^2$$

$$\int X_c\, dA = -\frac{5}{4} + \frac{5(16)}{4} = -\frac{5}{4} + \frac{80}{4}$$

$$\boxed{\int X_c\, dA = \frac{75}{4}}$$

Hallar $\int y_c \, dA$

$$\int y_c \, dA = \int_1^4 y\,(x\,dy)$$

Pero $y_c = y$

$dA = x\,dy$

$x = (\sqrt{5})(\sqrt{5-y})$

$$\int y_c \, dA = \int_1^4 y\,(\sqrt{5})(\sqrt{5-y})\,dy$$

$$\int y_c \, dA = \sqrt{5}\int_1^4 y\,(\sqrt{5-y})\,dy = \sqrt{5}\int_1^4 y\,(5-y)^{1/2}\,dy$$

$$\int y_c \, dA = \sqrt{5}\int_1^4 (5-u)(u)^{1/2}(-du)$$

Pero

$\boxed{u = 5-y}$

$du = -dy$

$-du = dy$

$u = 5-y$

$\boxed{y = 5-u}$

$$\int y_c \, dA = -\sqrt{5}\int_1^4 (5-u)(u)^{1/2}\,du$$

$$\int y_c \, dA = -\sqrt{5}\int_1^4 5u^{1/2}\,du + \sqrt{5}\int_1^4 (u)(u)^{1/2}\,du$$

$$\int y_c \, dA = -5\sqrt{5}\int_1^4 u^{1/2}\,du + \sqrt{5}\int_1^4 u^{3/2}\,du$$

$$\int y_c \, dA = -5\sqrt{5}\,\frac{(u)^{1/2+1}}{1/2+1}\Bigg|_1^4 + \sqrt{5}\,\frac{(u)^{3/2+1}}{3/2+1}\Bigg|_1^4$$

$$\int y_c \, dA - 5\sqrt{5}\,\frac{(u)^{3/2}}{3/2}\Bigg|_1^4 + \sqrt{5}\,\frac{(u)^{5/2}}{5/2}\Bigg|_1^4$$

$$\int y_c \, dA = -5\sqrt{5}\left(\frac{2}{3}\right)(u)^{3/2}\Big|_1^4 + \sqrt{5}\left(\frac{2}{5}\right)(u)^{5/2}\Big|_1^4$$

$$\int y_c \, dA = -\frac{10\sqrt{5}}{3}(u)^{3/2}\Big|_1^4 + \frac{2\sqrt{5}}{5}(u)^{5/2}\Big|_1^4$$

$$\int y_c \, dA = -\frac{10\sqrt{5}}{3}(5-y)^{3/2}\Big|_1^4 + \frac{2\sqrt{5}}{5}(5-y)^{5/2}\Big|_1^4$$

$$\int y_c \, dA = -\frac{10\sqrt{5}}{3}(5-4)^{3/2} + \frac{10\sqrt{5}}{3}(5-1)^{3/2} + \frac{2\sqrt{5}}{5}(5-4)^{5/2} - \frac{2\sqrt{5}}{5}(5-1)^{5/2}$$

$$\int y_c \, dA = -\frac{10\sqrt{5}}{3}(1)^{3/2} + \frac{10\sqrt{5}}{3}(4)^{3/2} + \frac{2\sqrt{5}}{5}(1)^{5/2} - \frac{2\sqrt{5}}{5}(4)^{5/2}$$

$$\int y_c \, dA = \frac{-10\sqrt{5}}{3} + \frac{10\sqrt{5}}{3}(8) + \frac{2\sqrt{5}}{5} - \frac{2\sqrt{5}}{5}(32)$$

$$\int y_c \, dA = \frac{-10\sqrt{5}}{3} + \frac{80\sqrt{5}}{3} + \frac{2\sqrt{5}}{5} - \frac{64\sqrt{5}}{5}$$

$$\int y_c \, dA = \frac{70\sqrt{5}}{3} - \frac{62\sqrt{5}}{5} = \frac{350\sqrt{5} - 186\sqrt{5}}{15}$$

$$\boxed{\int y_c \, dA = \frac{164\sqrt{5}}{15}}$$

$$\bar{X} = \frac{\int x_c \, dA}{A} = \frac{\frac{75}{4}}{\frac{14\sqrt{5}}{3}} = \frac{3(75)}{4(14\sqrt{5})} = \frac{225}{56\sqrt{5}}$$

$$\bar{X} = \frac{225}{125{,}21} = 1{,}796$$

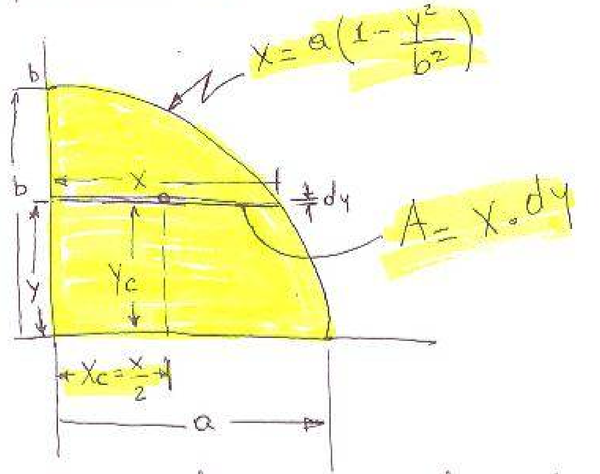
$$\boxed{\bar{X} = 1{,}796}$$

$$\bar{Y} = \frac{\int y_c \, dA}{A} = \frac{\frac{164\sqrt{5}}{15}}{\frac{14\sqrt{5}}{3}} = \frac{\cancel{3}(164\sqrt{5})}{\cancel{15}(14\cancel{\sqrt{5}})}$$

$$\bar{Y} = \frac{164}{5(14)} = \frac{164}{70} = 2{,}342$$

$$\boxed{\bar{Y} = 2{,}342}$$

Problema 5.14 MERIAM EDIC 3.



Hallamos el area sombreada por diferencial horizontal

$A = \int dA = \int_0^b x\,dy$ Pero $x = a\left(1-\frac{y^2}{b^2}\right)$

$A = \int_0^b a\left(1-\frac{y^2}{b^2}\right)dy$

$A = a\int_0^b \left(1-\frac{y^2}{b^2}\right)dy = a\int_0^b dy - a\int_0^b \frac{y^2}{b^2}dy$

$A = a\int_0^b dy - \frac{a}{b^2}\int_0^b y^2 dy$

$A = a(y)\Big|_0^b - \frac{a}{b^2}\frac{(y)^3}{3}\Big|_0^b$

$A = a(b) - \cancel{a(0)} - \frac{a}{b^2}\frac{(b)^3}{3} + \cancel{\frac{a}{b^2}}\frac{(0)^3}{3}$

$A = ab - \frac{ab^{\cancel{3}}}{3\cancel{b^2}} = ab - \frac{ab}{3}$

$A = \frac{3ab - ab}{3} = \frac{2}{3}ab$

$\boxed{A = \frac{2}{3}ab}$ Area total

Hallar $\int X_c\,dA$

Pero $X_c = \frac{x}{2}$

$dA = x\,dy$

Pero $x = a\left(1-\frac{y^2}{b^2}\right)$

$x^2 = a^2\left(1-\frac{y^2}{b^2}\right)^2$

$\int X_c\,dA = \int_0^b \left(\frac{x}{2}\right)(x\,dy)$

$\int X_c\,dA = \frac{1}{2}\int_0^b x^2 dy$

$\int X_c\,dA = \frac{1}{2}\int_0^b a^2\left(1-\frac{y^2}{b^2}\right)^2 dy$

$\int X_c\,dA = \frac{a^2}{2}\int_0^b \left(1-\frac{y^2}{b^2}\right)^2 dy$

$\int X_c\,dA = \frac{a^2}{2}\int_0^b \left[1 - \frac{2y^2}{b^2} + \left(\frac{y^2}{b^2}\right)^2\right]dy$

$\int X_c\,dA = \frac{a^2}{2}\int_0^b dy - \frac{a^2}{2}\int_0^b \frac{2y^2}{b^2}dy + \frac{a^2}{2}\int_0^b \left(\frac{y^2}{b^2}\right)^2 dy$

$\int X_c\,dA = \frac{a^2}{2}\int_0^b dy - \frac{\cancel{2}a^2}{\cancel{2}b^2}\int_0^b y^2 dy + \frac{a^2}{2b^4}\int_0^b y^4 dy$

$\int X_c\,dA = \frac{a^2}{2}(y)\Big|_0^b - \frac{a^2}{b^2}\frac{(y)^3}{3}\Big|_0^b + \frac{a^2}{2b^4}\frac{(y)^5}{5}\Big|_0^b$

$\int X_c\,dA = \frac{a^2}{2}(b) - \cancel{\frac{a^2b}{2}}(0) - \frac{a^2}{3b^2}(b)^3 + \cancel{\frac{a^2}{3b^2}}(0)^3$

$+ \frac{a^2}{10b^4}(b)^5 - \cancel{\frac{a^2}{10b^4}}(0)^5$

$\int X_c\,dA = \frac{a^2b}{2} - \frac{a^2\cancel{b^3}}{3\cancel{b^2}} + \frac{a^2\cancel{b^5}}{10\cancel{b^4}}$

$\int X_c\,dA = \frac{1}{2}a^2b - \frac{1}{3}a^2b + \frac{1}{10}a^2b$

$\int X_c\,dA = \frac{15a^2b - 10a^2b + 3a^2b}{30}$

$$\int X_c \, dA = \frac{\cancel{8}a^2 b}{\cancel{30}} = \frac{4a^2 b}{15}$$

$$\boxed{\int X_c \, dA = \frac{4}{15} a^2 b}$$

Hallar $\int Y_c \, dA$ Pero $Y_c = Y$

$dA = X\,dy$

$$\int Y_c \, dA = \int_0^b (Y)(X\,dy)$$

Pero $X = a\left(1 - \frac{Y^2}{b^2}\right)$

$$\int Y_c \, dA = \int_0^b (Y)\left[a\left(1 - \frac{Y^2}{b^2}\right)\right] dy$$

$$\int Y_c \, dA = a\int_0^b Y\left[1 - \frac{Y^2}{b^2}\right] dy$$

$$\int Y_c \, dA = a\int_0^b \left(Y - \frac{Y^3}{b^2}\right) dy$$

$$\int Y_c \, dA = a\int_0^b Y\,dy - a\int_0^b \frac{Y^3}{b^2}\,dy$$

$$\int Y_c \, dA = a\int_0^b Y\,dy - \frac{a}{b^2}\int_0^b Y^3\,dy$$

$$\int Y_c \, dA = a\frac{(Y)^2}{2}\Big|_0^b - \frac{a}{b^2}\frac{(Y)^4}{4}\Big|_0^b$$

$$\int Y_c \, dA = \frac{a}{2}(b)^2 - \cancel{\frac{a}{2}(0)^2}^{0} - \frac{a}{4b^2}(b)^4 + \cancel{\frac{a}{4b^2}(0)^4}^{0}$$

$$\int Y_c \, dA = \frac{ab^2}{2} - \frac{ab^2}{4}$$

$$\int Y_c \, dA = \frac{2ab^2 - ab^2}{4} = \frac{ab^2}{4}$$

$$\boxed{\int Y_c \, dA = \frac{ab^2}{4}}$$

$$\bar{X} = \frac{\int X_c \, dA}{A} = \frac{\frac{4a^2b}{15}}{\frac{2ab}{3}} = \frac{\cancel{3}(\cancel{4}a^{\cancel{2}}\cancel{b})}{\cancel{15}(\cancel{2}\cancel{a}\cancel{b})}$$

$$\boxed{\bar{X} = \frac{2a}{5}}$$

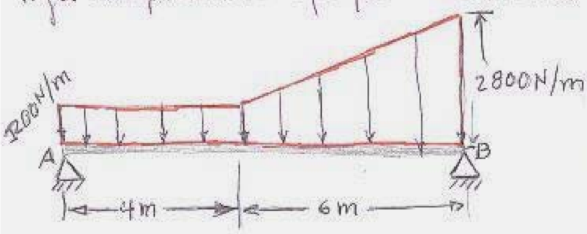
$$\bar{Y} = \frac{\int Y_c \, dA}{A} = \frac{\frac{ab^2}{4}}{\frac{2ab}{3}}$$

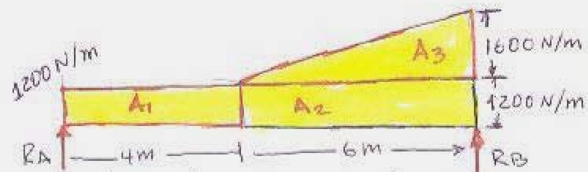
$$\bar{Y} = \frac{3(\cancel{a}b^{\cancel{2}})}{4(2\cancel{a}\cancel{b})} = \frac{3b}{8}$$

$$\boxed{\bar{Y} = \frac{3b}{8}}$$

Problema tipo 5.9 Meriam edic 3

Determinar las cargas concentradas equivalentes y las reacciones exteriores en la viga simplemente apoyada sometida a la carga distribuida que se muestra.



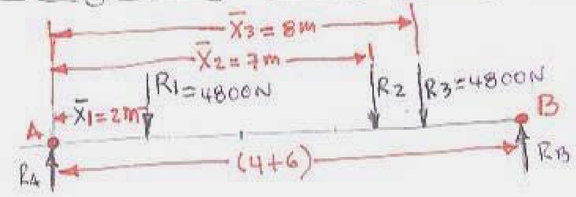


Se divide en tres areas, cada area equivale a una fuerza ejercida hacia abajo.

$A_1 = R_1$ (Newton)

$A_2 = R_2$ (Newton)

$A_3 = R_3$ (Newton)



$\circlearrowleft + \; M_A = 0$

$-R_1(2) - R_2(7) - R_3(8) + R_B(4+6) = 0$

$-2R_1 - 7R_2 - 8R_3 + 10R_B = 0$

$-2(4800) - 7(7200) - 8(4800) + 10R_B = 0$

$-9600 - 50400 - 38400 + 10R_B = 0$

$-96400 + 10R_B = 0$

$10R_B = 98400$

$R_B = \frac{98400}{10} = 9840\ N$

$\boxed{R_B = 9840N}$

$A_1 = (4)(1200) = 4800\ N$

$\boxed{A_1 = R_1 = 4800N}$

$\bar{X}_1 = \frac{(4)}{2} = 2m$

$\boxed{\bar{X}_1 = 2m}$

$A_2 = (6)(1200) = 7200\ N$

$\boxed{A_2 = R_2 = 7200\ N}$

$\bar{X}_2 = 4 + \left(\frac{6}{2}\right) = 4 + 3 = 7\ m$

$\boxed{\bar{X}_2 = 7m}$

$A_3 = \frac{1}{2}(6)(1600) = 4800\ N$

$\boxed{A_3 = R_3 = 4800\ N}$

$\bar{X}_3 = 4 + \frac{2}{3}(6) = 4 + 4 = 8\ m$

$\boxed{\bar{X}_3 = 8m}$

$\Sigma F_y = 0$

$R_A - R_1 - R_2 - R_3 + R_B = 0$

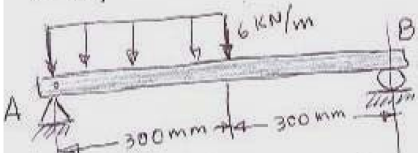
$R_A - 4800 - 7200 - 4800 + 9840 = 0$

$R_A - 6960 = 0$

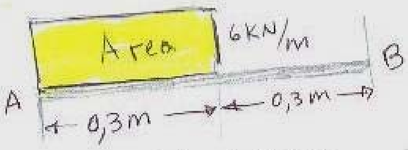
$\boxed{R_A = 6960\ N}$

PROBLEMA 5.95 MERIAM EDIC 3

Para la viga sometida a la distribucion de carga uniforme. Hallar las reacciones en A y B.



se halla el area, que es la fuerza R hacia abajo

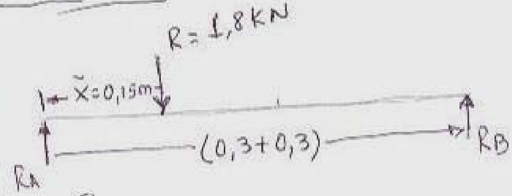


$A = (0{,}3)(6) = 1{,}8\ KN$

$\boxed{A = 1{,}8\ KN} = R$

$\bar{X} = \frac{(0{,}3)}{2} = 0{,}15\ m$

$\boxed{\bar{X} = 0{,}15\ m}$



$\sum M_A = 0$

$-1{,}8(0{,}15) + R_B(0{,}3+0{,}3) = 0$

$-0{,}27 + 0{,}6 R_B = 0$

$0{,}6 R_B = 0{,}27$

$R_B = \frac{0{,}27}{0{,}6} = 0{,}45\ KN$

$\boxed{R_B = 0{,}45\ KN}$

$\sum F_Y = 0$

$R_A - 1{,}8 + R_B = 0$

$R_A - 1{,}8 + 0{,}45 = 0$

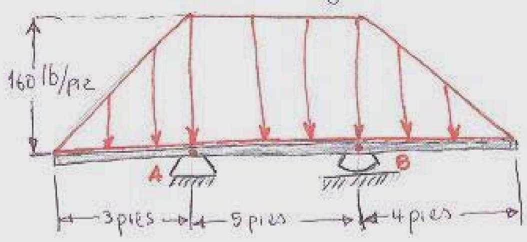
$R_A - 1{,}35 = 0$

$\boxed{R_A = 1{,}35\ KN}$

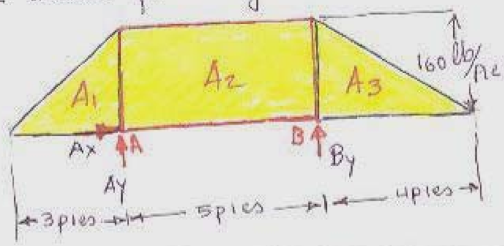
Problema 5.95 MERIAM EDIC 5

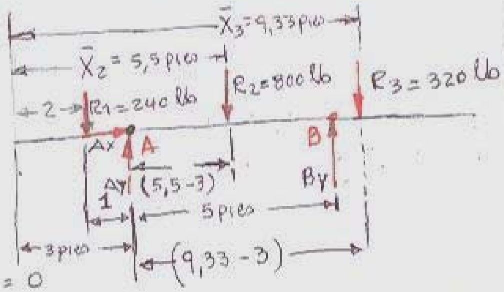
Hallar las reacciones en los apoyos.

El Quintero octubre 14-2011



Se divide en tres areas, cada area equivale a una fuerza ejercida hacia abajo.





$+M_A = 0$

$R_1(1) - R_2(5,5-3) + B_y(5) - R_3(9,33-3) = 0$

$R_1 - R_2(2,5) + B_y(5) - R_3(6,33) = 0$

$240 - 800(2,5) + B_y(5) - 320(6,33) = 0$

$240 - 2000 + 5B_y - 2025,6 = 0$

$-3785,6 + 5B_y = 0$

$5B_y = 3785,6$

$B_y = \frac{3785,6}{5} = 757,12$ lb

$\boxed{B_y = 757,12 \text{ lb}}$

$A_1 = \frac{1}{2}(3)(160) = 240$ lb

$\boxed{A_1 = R_1 = 240 \text{ lb}}$

$\bar{X}_1 = \frac{2}{3}(3) = 2$ pies

$\boxed{\bar{X}_1 = 2 \text{ pies}}$

$A_2 = (5)(160) = 800$ lb

$\boxed{A_2 = R_2 = 800 \text{ lb}}$

$\bar{X}_2 = 3 + \frac{(5)}{2} = 3 + 2,5 = 5,5$ pies

$\boxed{\bar{X}_2 = 5,5 \text{ pies}}$

$A_3 = \frac{1}{2}(4)(160)$

$\boxed{A_3 = 320 \text{ lb} = R_3}$

$\bar{X}_3 = 3 + 5 + \frac{1}{3}(4)$

$\bar{X}_3 = 8 + \frac{4}{3} = \frac{24+4}{3} = \frac{28}{3}$ pies

$\boxed{\bar{X}_3 = 9,33 \text{ pies}}$

$\Sigma F_x = 0$

$A_x = 0$

$\Sigma F_y = 0$

$A_y - R_1 - R_2 + B_y - R_3 = 0$

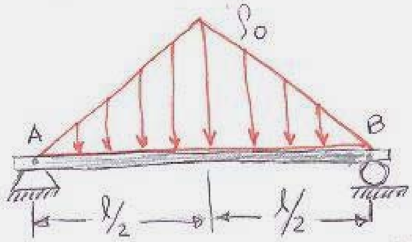
$A_y - 240 - 800 + 757,12 - 320 = 0$

$A_y - 602,88 = 0$

$\boxed{A_y = 602,88 \text{ lb}}$

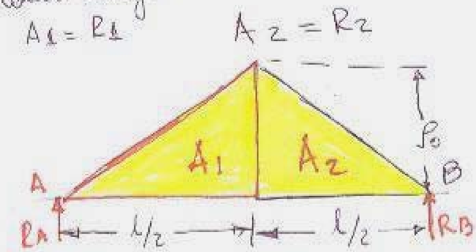
PROBLEMA 5.96 MERIAM EDIC3

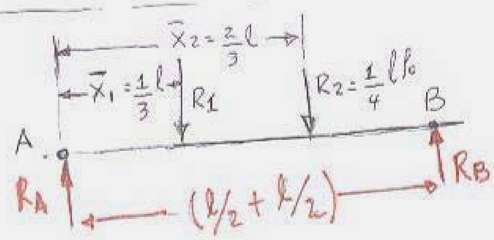
HALLAR LAS REACCIONES en A y B de la viga cargada como se muestra



Se divide en dos areas, cada area equivale a una fuerza ejercida hacia abajo

$A_1 = R_1$ $\quad$ $A_2 = R_2$





$\circlearrowleft + M_A = 0$

$$-R_1\left(\frac{1}{3} l\right) - R_2\left(\frac{2}{3} l\right) + R_B(l/2 + l/2) = 0$$

$$-\frac{1}{4} l \rho_0 \left(\frac{1}{3} l\right) - \frac{1}{4} l \rho_0 \left(\frac{2}{3} l\right) + R_B(l) = 0$$

$$-\frac{l^2 \rho_0}{12} - \frac{2 l^2 \rho_0}{12} + R_B l = 0$$

$$-\frac{\cancel{3} l^2 \rho_0}{\cancel{12}} + R_B l = 0 \Rightarrow R_B l = \frac{\cancel{3}}{\cancel{12}} l^2 \rho_0$$

$$R_B = \frac{l^{\cancel{2}} \rho_0}{\cancel{l} 4}$$

$$\boxed{R_B = \frac{1}{4} l \rho_0}$$

$$A_1 = \frac{1}{2} (l/2) \rho_0$$

$$\boxed{R_1 = \frac{1}{4} l \rho_0}$$

$$\bar{x}_1 = \frac{2}{3} (l/2)$$

$$\boxed{\bar{x}_1 = \frac{1}{3} l}$$

$$A_2 = \frac{1}{2} \left(\frac{l}{2}\right) \rho_0$$

$$\boxed{R_2 = \frac{1}{4} l \rho_0}$$

$$\bar{x}_2 = \frac{l}{2} + \frac{1}{3}\left(\frac{l}{2}\right)$$

$$\bar{x}_2 = l/2 + \frac{1}{6} l = \frac{3l + l}{6}$$

$$\bar{x}_2 = \frac{\cancel{4} l}{\cancel{6}} = \frac{2l}{3} \qquad \boxed{\bar{x}_2 = \frac{2}{3} l}$$

$\Sigma F_y = 0$

$$R_A - R_1 - R_2 + R_B = 0$$

$$R_A - \frac{1}{4} l \rho_0 - \cancel{\frac{1}{4} l \rho_0} + \cancel{\frac{1}{4} l \rho_0} = 0$$

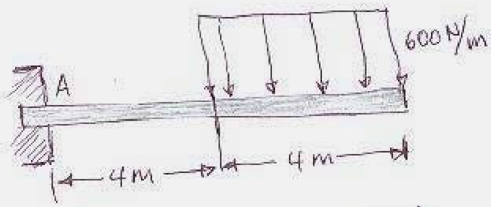
$$R_A - \frac{1}{4} l \rho_0 = 0$$

$$\boxed{R_A = \frac{1}{4} l \rho_0}$$

l. Quintero
Octubre 14-2011

Problema 5.97 MERIAM EDIC 3

Calcular la fuerza resistente R_A y el momento resistente M_A en el empotramiento A de la viga en voladizo cargada

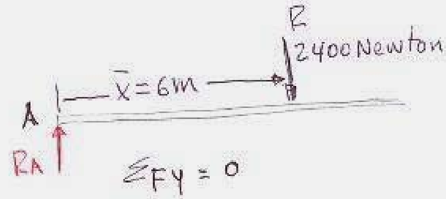


Se halla el area, que equivale a una fuerza ~~hac~~ hacia abajo

$A = (4)(600) = 2400 \text{ Newton} = R$

$\bar{X} = 4 + \frac{(4)}{2} = 4 + 2 = 6 \text{ m}$

$\boxed{\bar{X} = 6 \text{ m}}$



$\Sigma F_Y = 0$

$R_A - 2400 = 0$

$\boxed{R_A = 2400 \text{ Newton}}$

$\Sigma M_A = 0$

$M_A - 2400(6) = 0$

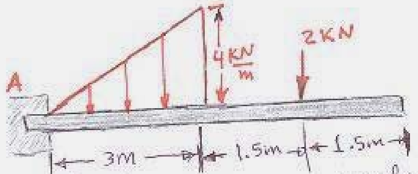
$M_A = 2400(6)$

$\boxed{M_A = 14400 \text{ N.m}}$

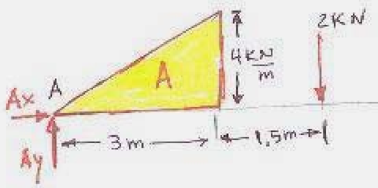
E. Quintero
13 octubre - 2011

PROBLEMA 5.97 MERIAM EDIC 5

Determinar las reacciones



Se halla el area, que equivale a una fuerza hacia abajo.

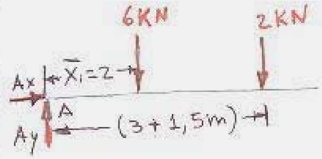


$A = \frac{1}{2}(3)(4) = 6\,KN$

$\boxed{A = R_1 = 6\,KN}$

$\bar{X}_1 = \frac{2}{3}(3) = 2\,m$

$\boxed{\bar{X}_1 = 2\,m}$



$\Sigma F_x = 0$

$A_x = 0$

$\Sigma F_y = 0$

$A_y - 6 - 2 = 0$

$A_y - 8 = 0$

$\boxed{A_y = 8\,KN}$ ↑

$\circlearrowleft + M_A = 0$

$M_A - 6(2) - 2(3+1,5) = 0$

$M_A - 12 - 2(4,5) = 0$

$M_A - 12 - 9 = 0$

$\boxed{M_A = 21\,KN\text{-}m}$

PROBLEMA 5.101 MERIAM EDIC 3

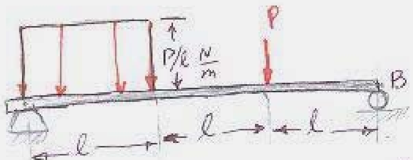
Para la viga cargada como se muestra, hallar las reacciones en A y B.

$A = (\ell)\left(\frac{P}{\ell}\right) = P$

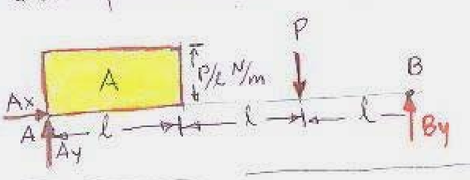
$\boxed{A = P\ \text{Newton} = R_1}$

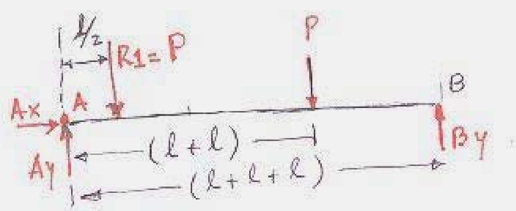
$\bar{X} = \frac{(\ell)}{2}$

$\boxed{\bar{X} = \frac{\ell}{2}\,m}$



se halla el area, que equivale a una fuerza hacia abajo.





$\circlearrowleft + M_A = 0$

$-R_1(\ell/2) - P(\ell+\ell) + B_y(\ell+\ell+\ell) = 0$

$-P(\ell/2) - P(2\ell) + B_y(3\ell) = 0$

$\frac{-P\ell - 4P\ell}{2} + B_y(3\ell) = 0$

$-\frac{5}{2}P\ell + B_y(3\ell) = 0$

$B_y(3\cancel{\ell}) = \frac{5}{2}P\cancel{\ell}$

$B_y = \frac{5}{(3)(2)}P = \frac{5}{6}P$

$\boxed{B_y = \frac{5}{6}P}$

$\Sigma F_x = 0 \quad A_x = 0$

$A_y - R_1 - P + B_y = 0$

$A_y - P - P + \frac{5}{6}P = 0$

$A_y - 2P + \frac{5}{6}P = 0$

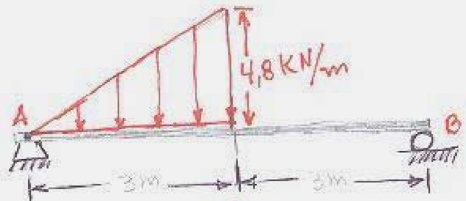
$A_y - \frac{12}{6}P + \frac{5}{6}P = 0$

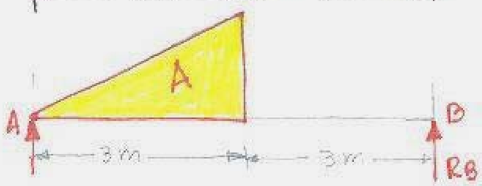
$A_y - \frac{7}{6}P = 0$

$\boxed{A_y = \frac{7}{6}P}$

PROBLEMA 5.98 MERIAM EDIC 3.

Para la viga sometida a la distribución de carga triangular. Calcular las reacciones en A y B.



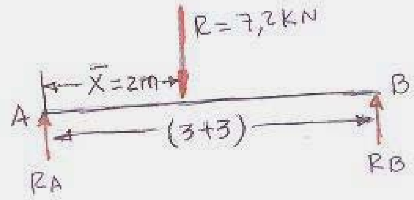


Se halla el area, que equivale a una fuerza resultante hacia abajo.

$$A = \left(\tfrac{1}{2}\right)(3)(4{,}8) = 7{,}2\,KN$$

$$\boxed{A = R = 7{,}2\,KN}$$

$$\bar{X} = \tfrac{2}{3}(3) = 2m \qquad \boxed{\bar{X} = 2m}$$



$\circlearrowleft M_A = 0$

$$-R(\bar{x}) + R_B(3+3) = 0$$

$$-7{,}2(2) + R_B(6) = 0$$

$$-14{,}4 + 6R_B = 0$$

$$6R_B = 14{,}4$$

$$R_B = \frac{14{,}4}{6} = 2{,}4\,KN \qquad \boxed{R_B = 2{,}4\,KN \uparrow}$$

$\Sigma F_Y = 0 \quad R_A + R_B - R = 0$

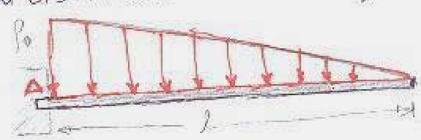
$$R_A + 2{,}4 - 7{,}2 = 0$$

$$R_A - 4{,}8 = 0$$

$$\boxed{R_A = 4{,}8\,KN}$$

PROBLEMA 5.99 MERIAM EDIC 3

Hallar las reacciones en el extremo empotrado de la viga sometida a la distribucion de carga triangular

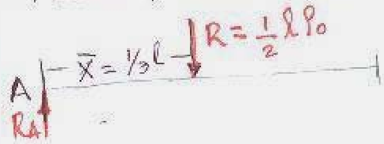


Se halla el area, que equivale a una fuerza resultante hacia abajo.

$$A = \tfrac{1}{2}(l)(\rho_0)$$

$$\boxed{A = R = \tfrac{1}{2}\, l\rho_0}$$

$$\boxed{\bar{X} = \tfrac{1}{3}\, l}$$



$\Sigma F_Y = 0 \quad R_A - R = 0$

$$R_A = R$$

$$\boxed{R_A = \tfrac{1}{2}\, l\rho_0}$$

$\circlearrowleft + M_A = 0$

$$M_A - R(\bar{x}) = 0$$

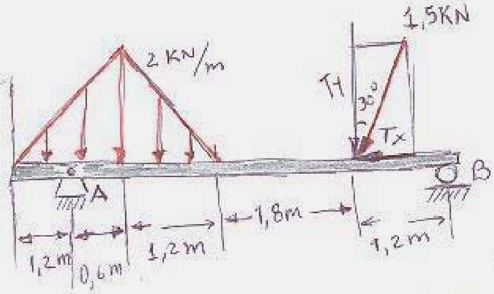
$$M_A = R(\bar{x})$$

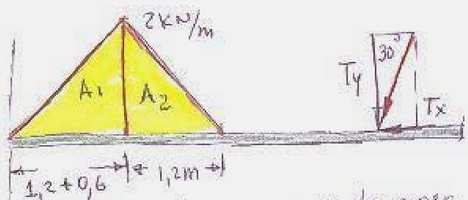
$$M_A = \left(\tfrac{1}{2}\, l\rho_0\right)\left(\tfrac{1}{3}\, l\right)$$

$$\boxed{M_A = \tfrac{1}{6}\, l^2\rho_0}$$

PROBLEMA 5,99 MERIAM EDIC 5

Determinar las reacciones





Se divide en dos areas, cada area equivale a una fuerza ejercida hacia abajo

$A_1 = R_1$ (kN)

$A_2 = R_2$ (kN)

$A_1 = \frac{1}{2}(1,2+0,6)(2) = \frac{1}{2}(1,8)(2) = 1,8$ kN

$\boxed{A_1 = R_1 = 1,8 \text{ kN}}$

$\bar{X}_1 = \frac{2}{3}(1,2+0,6) = \frac{2}{3}(1,8) = 1,2$ m

$\boxed{\bar{X}_1 = 1,2 \text{ m}}$

$A_2 = \frac{1}{2}(1,2)(2) = 1,2$ kN

$\boxed{A_2 = 1,2 \text{ kN}} = R_2$

$\bar{X}_2 = (1,2+0,6) + \frac{1}{3}(1,2) = (1,8) + (0,4) = 2,2$ m

$\boxed{\bar{X}_2 = 2,2 \text{ m}}$

$\text{Sen } 30 = \frac{Tx}{1,5} \Rightarrow Tx = 1,5 \text{ sen } 30$

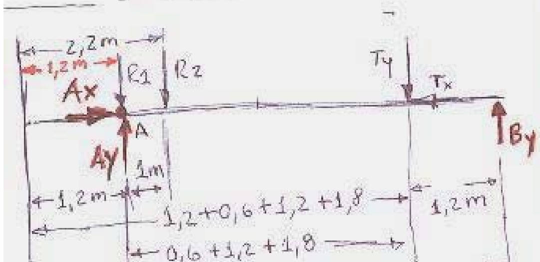
$Tx = 1,5(0,5) = 0,75$

$\boxed{Tx = 0,75 \text{ KN}}$

$\text{Cos } 30 = \frac{Ty}{1,5} \Rightarrow Ty = 1,5 \cos 30$

$Ty = 1,5(0,86)$

$\boxed{Ty = 1,3 \text{ KN}}$



$\circlearrowleft + M_A = 0$

$-R_2(1) - Ty(0,6+1,2+1,8) + By(0,6+1,2+1,8+1,2) = 0$

$-R_2 - Ty(3,6) + By(4,8) = 0$

$-1,2 - 3,6\,Ty + 4,8\,By = 0$

$4,8\,By = 1,2 + 3,6(1,3)$

$4,8\,By = 1,2 + 4,68$

$4,8\,By = 5,88$

$By = \frac{5,88}{4,8} = 1,225$ kN

$\boxed{By = 1,225 \text{ KN}}$

$\Sigma Fx = 0$

$Ax - Tx = 0$

$Ax = Tx$

$\boxed{Ax = 0,75 \text{ KN}}$

$\Sigma Fy = 0$

$Ay - R_1 - R_2 - Ty + By = 0$

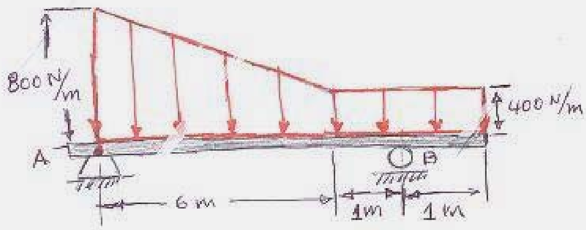
$Ay - 1,8 - 1,2 - 1,3 + 1,225 = 0$

$Ay - 3,075 = 0$

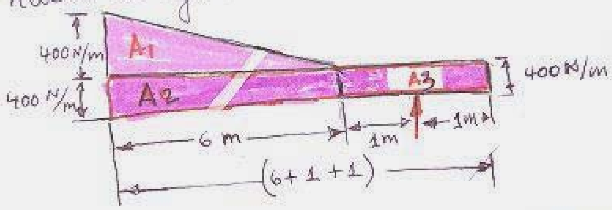
$\boxed{Ay = 3,075 \text{ KN}}$

PROBLEMA 5.103 MERIAM EDIC 3

HALLAR LAS reacciones en los apoyos de las viga cargada como se muestra.



Se divide en areas, cada area equivale a una fuerza ejercida hacia abajo.



$A_1 = \frac{1}{2}(6)(400) = 1200\ N$

$\boxed{A_1 = R_1 = 1200 N}$

$\bar{X}_1 = \frac{1}{3}(6) = 2m$

$\boxed{\bar{X}_1 = 2m}$

$A_2 = (6)(400)$

$\boxed{A_2 = R_2 = 2400 N}$

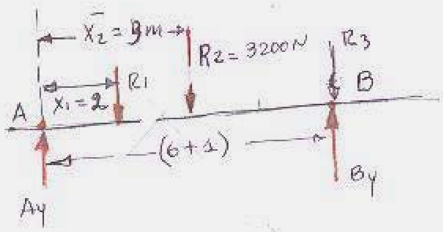
$\bar{X}_2 = \frac{(6)}{2}$

$\boxed{\bar{X}_2 = 3m}$

$A_3 = (1+1)(400) = 2(400) = 800 N$

$\bar{X}_3 = 6 + \frac{(1+1)}{2} = 6 + 1 = 7 m$

$\boxed{\bar{X}_3 = 7m}$



$\circlearrowleft + \Sigma M_A = 0$

$-R_1(2) - R_2(3) + B_y(6+1) - R_3(6+1) = 0$

$-1200(2) - 2400(3) + B_y(7) - 800(7) = 0$

$-2400 - 7200 + 7B_y - 5600 = 0$

$-15200 + 7B_y = 0$

$7B_y = 15200$

$B_y = \frac{15200}{7} = 2171,4$

$\boxed{B_y = 2171,4\ N}$

$\Sigma F_y = 0$

$A_y - R_1 - R_2 + B_y = 0$

$A_y - 1200 - 3200 + 2171,42 = 0$

$A_y = 1200 + 3200 - 2171,42$

$\boxed{A_y = 2228,58\ N}$

$\circlearrowleft + \Sigma M_B = 0$

$-A_y(7) + R_1(5) + R_2(4) = 0$

$1200(5) + 2400(4) = A_y(7)$

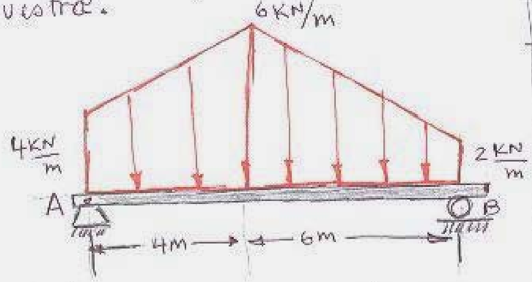
$6000 + 9600 = 7A_y$

$\frac{15600}{7} = A_y$

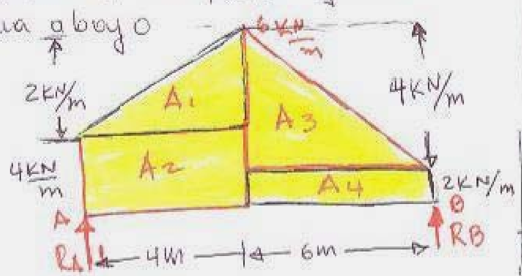
$\boxed{A_y = 2228,57\ N}$

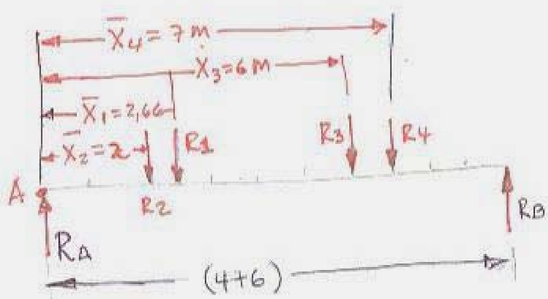
Problema 5.104 MERIAM EDIC 3

Hallar las reacciones en los apoyos de la viga cargada como se muestra.



Se divide en 4 areas, cada area equivale a una fuerza ejercida hacia abajo





$\circlearrowleft + M_A = 0$

$-R_2(2) - R_1(2{,}66) - R_3(6) - R_4(7) + R_B(4+6) = 0$

$-16(2) - 4(2{,}66) - 12(6) - 12(7) + R_B(10) = 0$

$-32 - 10{,}64 - 72 - 84 + R_B(10) = 0$

$-198{,}64 + 10R_B = 0$

$10R_B = 198{,}64$

$R_B = \frac{198{,}64}{10} = 19{,}86$ Newton

$\boxed{R_B = 19{,}86 \text{ Newton}}$

$A_1 = \frac{1}{2}(4)(2) = 4\ KN$ $\qquad \bar{X}_1 = \frac{2}{3}(4) = 8/3\ m$

$\boxed{A_1 = R_1 = 4KN}$ $\qquad \boxed{\bar{X}_1 = 2{,}66\ m}$

$A_2 = (4)(4) = 16\ KN$ $\qquad \bar{X}_2 = \frac{(4)}{2} = 2\ m$

$\boxed{A_2 = R_2 = 16\ KN}$ $\qquad \boxed{\bar{X}_2 = 2\ m}$

$A_3 = \frac{1}{2}(6)(4) = 12KN$ $\qquad \bar{X}_3 = 4 + \frac{1}{3}(6) = 4 + 2 = 6m$

$\boxed{A_3 = R_3 = 12KN}$ $\qquad \boxed{\bar{X}_3 = 6\ m}$

$A_4 = (6)(2) = 12\ KN$ $\qquad \bar{X}_4 = 4 + \frac{(6)}{2} = 4 + 3 = 7\ m$

$\boxed{A_4 = R_4 = 12KN}$

$\Sigma F_Y = 0$

$R_A - R_2 - R_1 - R_3 - R_4 + R_B = 0$

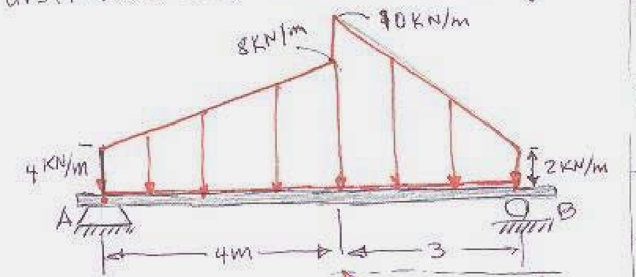
$R_A - 16 - 4 - 12 - 12 + 19{,}86 = 0$

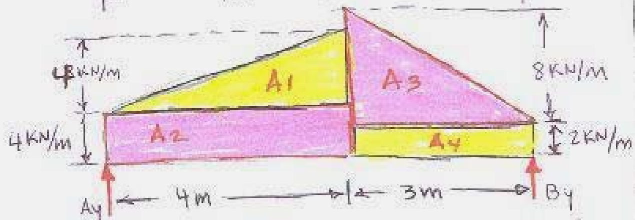
$R_A - 24{,}14 = 0$

$\boxed{R_A = 24{,}14 \text{ Newton}}$

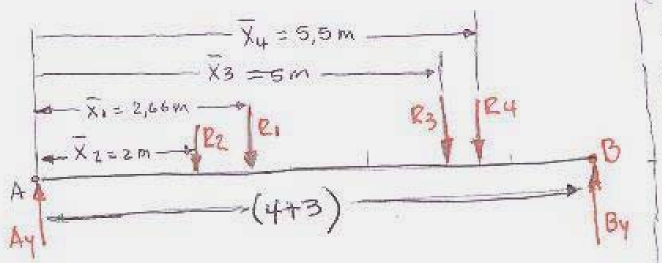
Problema 105 MERIAM EDIC 3

Para la viga sometida a las dos distribuciones lineales de carga





Se divide en 4 areas, cada area equivale a una fuerza ejercida hacia abajo



$+\Sigma M_A = 0$

$-R_2(2) - R_1(2,66) - R_3(5) - R_4(5,5) + B_y(7) = 0$

$-16(2) - 8(2,66) - 12(5) - 6(5,5) + B_y(7) = 0$

$-32 - 21,28 - 60 - 33 + 7B_y = 0$

$-146,28 + 7B_y = 0$

$7B_y = 146,28$

$B_y = \dfrac{146,28}{7} = 20,89$ KN

$\boxed{B_y = 20,89 \text{ KN}}$ ↑

E. Quintero
octubre 15-2011

$A_1 = \frac{1}{2}(4)(4) = \frac{16}{2} = 8$ kN

$\boxed{A_1 = R_1 = 8 \text{ kN}}$

$\bar{X}_1 = \frac{2}{3}(4) = \frac{8}{3}$ m

$\boxed{\bar{X}_1 = 2,66 \text{ m}}$

$A_2 = (4)(4) = 16$ kN

$\boxed{A_2 = 16 \text{ kN}} = R_2$

$\bar{X}_2 = \frac{(4)}{2} = 2$ m

$\boxed{\bar{X}_2 = 2 \text{ m}}$

$A_3 = \left(\frac{1}{2}\right)(3)(8) = \frac{24}{2} = 12$ KN

$\boxed{A_3 = R_3 = 12 \text{ KN}}$

$\bar{X}_3 = 4 + \frac{1}{3}(3) = 4 + 1 = 5$ m

$\boxed{\bar{X}_3 = 5 \text{ m}}$

$A_4 = (3)(2) = 6$ KN

$\boxed{A_4 = R_4 = 6 \text{ KN}}$

$\bar{X}_4 = 4 + \left(\frac{3}{2}\right) = 4 + 1,5 = 5,5$ m

$\bar{X}_4 = 5,5$ m

$\Sigma F_y = 0$

$A_y - R_2 - R_1 - R_3 - R_4 + B_y = 0$

$A_y - 16 - 8 - 12 - 6 + 20,89 = 0$

$A_y - 21,11 = 0$

$\boxed{A_y = 21,11 \text{ kN}}$ ↑