

-----1.1

1.1

$$\text{solve}\left(\begin{cases} ra1+rc1=p1 \\ -ma1+p1 \cdot l - rc1 \cdot 2 \cdot l = 0 \end{cases}, \{ra1, ma1\}\right)$$

$$ma1=l \cdot (p1-2 \cdot rc1) \text{ and } ra1=p1-rc1$$

-----1.2

1.2

$$rc1 \cdot x \rightarrow m1$$

$$rc1 \cdot x$$

$$rc1 \cdot (l+x) - p1 \cdot x \rightarrow m2$$

$$(rc1-p1) \cdot x + l \cdot rc1$$

$$\int_0^l \frac{m1^2}{2 \cdot ei} dx + \int_0^l \frac{m2^2}{2 \cdot 2 \cdot ei} dx \rightarrow u1$$

$$\frac{l^3 \cdot \left(\frac{p1^2}{12} - \frac{5 \cdot p1 \cdot rc1}{12} + \frac{3 \cdot rc1^2}{4} \right)}{ei}$$

$$\triangle \text{ solve}\left(\frac{d}{drc1}(u1)=0, rc1\right)$$

$$rc1 = \frac{5 \cdot p1}{18} \text{ or } l=0$$

$$ma1=l \cdot (p1-2 \cdot rc1) \text{ and } ra1=p1-rc1 | rc1 = \frac{5 \cdot p1}{18}$$

$$ma1 = \frac{4 \cdot l \cdot p1}{9} \text{ and } ra1 = \frac{13 \cdot p1}{18}$$

-----2

2

$$\text{solve}\left(\frac{4 \cdot p1 \cdot l}{9} = 2 \cdot mp, p1\right)$$

$$p1 = \frac{9 \cdot mp}{2 \cdot l}$$

$$\text{solve}\left(\frac{5 \cdot p1 \cdot l}{18} = mp, p1\right)$$

$$p1 = \frac{18 \cdot mp}{5 \cdot l}$$

$$p1 = \frac{9 \cdot mp}{2 \cdot l}$$

$$p1 = \frac{4.5 \cdot mp}{l}$$

$$p1 = \frac{18 \cdot mp}{5 \cdot l}$$

$$p1 = \frac{3.6 \cdot mp}{l}$$

-----3

3

$$\text{solve}\left(\begin{cases} ra2 + rc2 = p2 \\ -ma2 + p2 \cdot l - rc2 \cdot 2 \cdot l = 0 \\ mp - rc2 \cdot l = 0 \end{cases}, \{ra2, ma2, rc2\}\right)$$

$$ma2 = l \cdot p2 - 2 \cdot mp \text{ and } ra2 = \frac{l \cdot p2 - mp}{l} \text{ and } rc2 = \frac{mp}{l}$$

-----4

4

$$\text{solve}(ma2 = 2 \cdot mp, p2) | ma2 = l \cdot p2 - 2 \cdot mp$$

$$p2 = \frac{4 \cdot mp}{l}$$

$$rc2 \cdot x \rightarrow m3$$

$$rc2 \cdot x$$

$$rc^2 \cdot (l+x) - p^2 \cdot x \rightarrow m^4$$

$$(rc^2 - p^2) \cdot x + l \cdot rc^2$$

$$\int_0^l \frac{m^3}{2 \cdot ei} dx + \int_0^l \frac{m^4}{2 \cdot 2 \cdot ei} dx \rightarrow u^2$$

$$\frac{l^3 \cdot \left(\frac{p^2}{12} - \frac{5 \cdot p^2 \cdot rc^2}{12} + \frac{3 \cdot rc^2^2}{4} \right)}{ei}$$

$$\triangle \frac{d}{dp^2}(u^2) \Big|_{p^2 = \frac{4 \cdot mp}{l}} \text{ and } rc^2 = \frac{mp}{l}$$

$$\frac{l^2 \cdot mp}{4 \cdot ei}$$



-----1

1

$$\begin{bmatrix} \frac{3}{5} & \frac{4}{5} & \frac{4}{5} \\ \frac{4}{5} & \frac{3}{5} & \frac{-3}{5} \end{bmatrix} \rightarrow a$$

$$\begin{bmatrix} \frac{3}{5} & \frac{4}{5} & \frac{4}{5} \\ \frac{4}{5} & \frac{3}{5} & \frac{-3}{5} \\ \frac{5}{5} & \frac{5}{5} & \frac{5}{5} \end{bmatrix}$$

$$\triangle \frac{ea}{l} \cdot \begin{bmatrix} \frac{1}{5} & 0 & 0 \\ 0 & \frac{4}{15} & 0 \\ 0 & 0 & \frac{4}{15} \end{bmatrix} \rightarrow s$$

$$\begin{bmatrix} \frac{ea}{5 \cdot l} & 0 & 0 \\ 0 & \frac{4 \cdot ea}{15 \cdot l} & 0 \\ 0 & 0 & \frac{4 \cdot ea}{15 \cdot l} \end{bmatrix}$$

$$\triangle (a \cdot s \cdot a^T)^{-1} \cdot \begin{bmatrix} p \\ 0 \end{bmatrix} \rightarrow d$$

$$\begin{bmatrix} \frac{2.60055 \cdot l \cdot p}{ea} \\ -0.780166 \cdot l \cdot p \\ \frac{-0.780166 \cdot l \cdot p}{ea} \end{bmatrix}$$

$$\triangle s \cdot a^T \cdot (a \cdot s \cdot a^T)^{-1} \cdot \begin{bmatrix} p \\ 0 \end{bmatrix} \rightarrow q$$

$$\begin{bmatrix} 0.18724 \cdot p \\ 0.429958 \cdot p \\ 0.679612 \cdot p \end{bmatrix}$$

$$\text{solve}(q[3,1]=tp,p)$$

$$p=1.47143 \cdot tp$$

$$d[1,1]|_{p=1.4714285714285 \cdot tp}$$

$$\frac{3.82653 \cdot l \cdot tp}{ea}$$

$$\text{-----} -2$$

$$-2$$

$$\begin{bmatrix} \frac{3}{5} & \frac{4}{5} \\ \frac{4}{5} & \frac{3}{5} \end{bmatrix} \rightarrow a$$

$$\begin{bmatrix} \frac{3}{5} & \frac{4}{5} \\ \frac{4}{5} & \frac{3}{5} \end{bmatrix}$$

$$\triangle \frac{ea}{l} \cdot \begin{bmatrix} \frac{1}{5} & 0 \\ 0 & \frac{4}{15} \end{bmatrix} \rightarrow s$$

$$\begin{bmatrix} \frac{ea}{5 \cdot l} & 0 \\ 0 & \frac{4 \cdot ea}{15 \cdot l} \end{bmatrix}$$

$$\triangle (a \cdot s \cdot a^T)^{-1} \cdot \begin{bmatrix} p - \frac{4}{5} \cdot tp \\ \frac{3}{5} \cdot tp \end{bmatrix} \rightarrow d$$

$$\begin{bmatrix} \frac{53.5714 \cdot l \cdot (p - 1.4 \cdot tp)}{ea} \\ \frac{-53.5714 \cdot l \cdot (p - 1.45 \cdot tp)}{ea} \end{bmatrix}$$

$$\triangle s \cdot a^T \cdot (a \cdot s \cdot a^T)^{-1} \cdot \begin{bmatrix} p - \frac{4}{5} \cdot tp \\ \frac{3}{5} \cdot tp \end{bmatrix} \rightarrow q$$

$$\begin{bmatrix} 3.42857 \cdot tp - 2.14286 \cdot p \\ 2.85714 \cdot p - 3.57143 \cdot tp \end{bmatrix}$$

$$\text{solve}(q[1,1] = -tp, p)$$

$$p = 2.06667 \cdot tp$$

$$\text{solve}(q[2,1] = tp, p)$$

$$p = 1.6 \cdot tp$$

$$d[1,1] | p = 1.59999999999999 \cdot tp$$

$$\frac{10.7143 \cdot l \cdot tp}{ea}$$

$$\text{-----} -3$$


$$-3$$

$$\begin{bmatrix} \frac{4}{5} & \frac{4}{5} \\ \frac{3}{5} & -\frac{3}{5} \end{bmatrix} \rightarrow a$$

$$\begin{bmatrix} \frac{4}{5} & \frac{4}{5} \\ \frac{3}{5} & -\frac{3}{5} \end{bmatrix}$$

$$\triangle \frac{ea}{l} \cdot \begin{bmatrix} \frac{4}{15} & 0 \\ 0 & \frac{4}{15} \end{bmatrix} \rightarrow s$$

$$\begin{bmatrix} \frac{4 \cdot ea}{15 \cdot l} & 0 \\ 0 & \frac{4 \cdot ea}{15 \cdot l} \end{bmatrix}$$

	$(a \cdot s \cdot a^T)^{-1} \cdot \begin{bmatrix} p \\ 0 \end{bmatrix} \rightarrow d$	$\begin{bmatrix} \frac{2.92969 \cdot l \cdot p}{ea} \\ 0. \end{bmatrix}$
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	$s \cdot a^T \cdot (a \cdot s \cdot a^T)^{-1} \cdot \begin{bmatrix} p \\ 0 \end{bmatrix} \rightarrow q$	$\begin{bmatrix} 0.625 \cdot p \\ 0.625 \cdot p \end{bmatrix}$
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$\text{solve}(q[1,1]=tp,p)$	$p=1.6 \cdot tp$
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$d[1,1] _{p=1.6 \cdot tp}$	$\frac{4.6875 \cdot l \cdot tp}{ea}$
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\square

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-1

$$\text{solve}(p \cdot \theta \cdot l = mp \cdot 4 \cdot \theta, p)$$

$$p = \frac{4 \cdot mp}{l}$$




$$\frac{p \cdot l}{mp} \Big|_{p = \frac{4 \cdot mp}{l}}$$

4


-----2

-2



$$\text{expand}\left(\text{solve}\left(p \cdot 2 \cdot \theta \cdot l = mp \cdot 3 \cdot \theta + \frac{2 \cdot \theta \cdot l}{\sqrt{2}} \cdot tp, p\right)\right)$$

$$p = \frac{3 \cdot mp}{2 \cdot l} + \frac{tp \cdot \sqrt{2}}{2}$$




$$\text{expand}\left(\frac{p \cdot l}{mp} \Big|_{p = \frac{3 \cdot mp}{2 \cdot l} + \frac{tp \cdot \sqrt{2}}{2}}\right)$$

$$\frac{l \cdot tp \cdot \sqrt{2}}{2 \cdot mp} + \frac{3}{2}$$


-----3

3



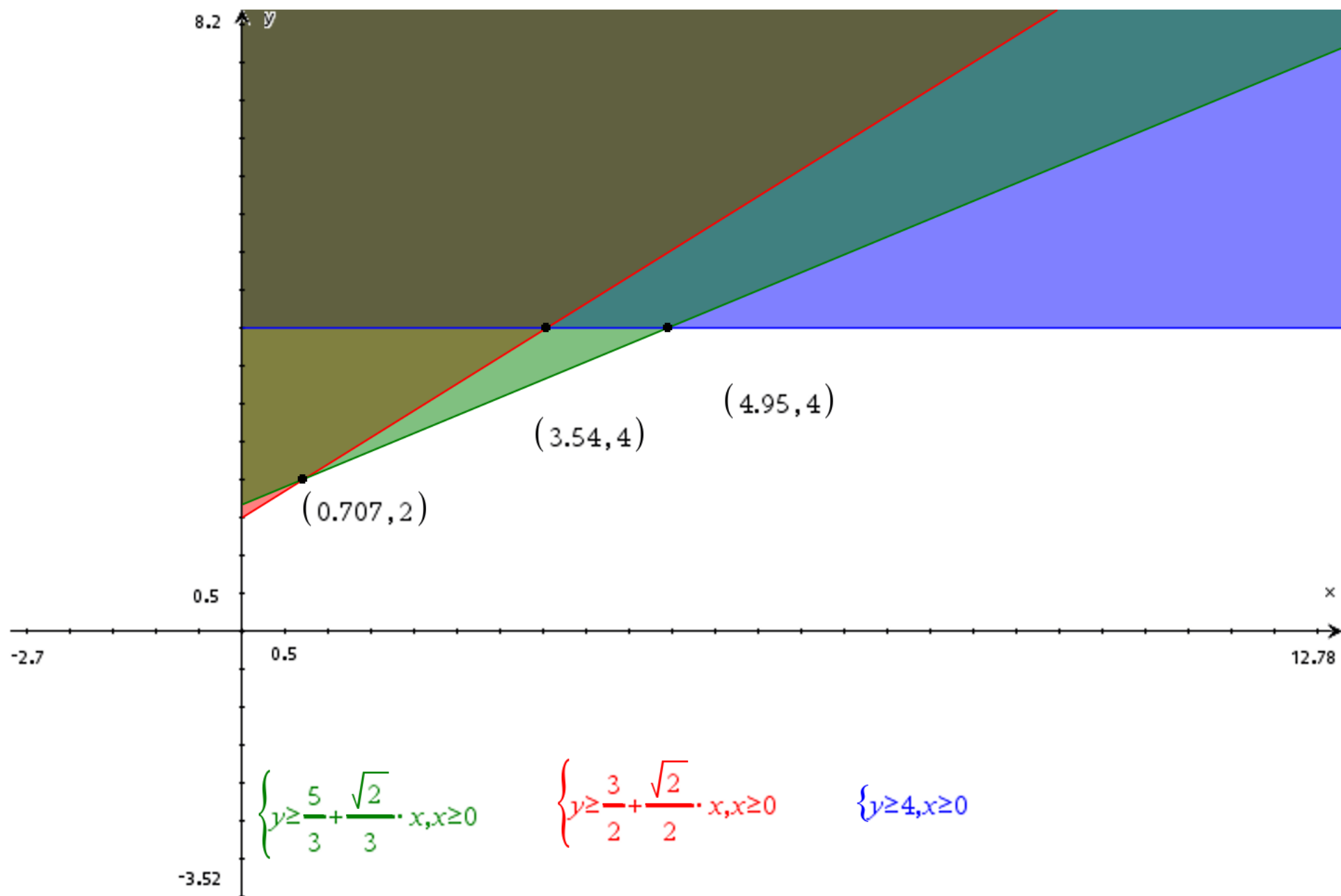
$$\text{expand}\left(\text{solve}\left(p \cdot 2 \cdot \theta \cdot l + p \cdot l \cdot \theta = mp \cdot 5 \cdot \theta + \frac{2 \cdot \theta \cdot l}{\sqrt{2}} \cdot tp, p\right)\right)$$

$$p = \frac{5 \cdot mp}{3 \cdot l} + \frac{tp \cdot \sqrt{2}}{3}$$



$$\text{expand}\left(\frac{p \cdot l}{mp} \Big|_{p = \frac{5 \cdot mp}{3 \cdot l} + \frac{tp \cdot \sqrt{2}}{3}}\right)$$

$$\frac{l \cdot tp \cdot \sqrt{2}}{3 \cdot mp} + \frac{5}{3}$$



-----1

-1

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 \\ 0 & 0 & \frac{-1}{9} & \frac{-1}{9} \end{bmatrix} \rightarrow a$$

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 \\ 0 & 0 & \frac{-1}{9} & \frac{-1}{9} \end{bmatrix}$$

$$\begin{bmatrix} \frac{4 \cdot ei}{12} & \frac{2 \cdot ei}{12} & 0 & 0 \\ \frac{2 \cdot ei}{12} & \frac{4 \cdot ei}{12} & 0 & 0 \\ 0 & 0 & \frac{4 \cdot ei}{9} & \frac{2 \cdot ei}{9} \\ 0 & 0 & \frac{2 \cdot ei}{9} & \frac{4 \cdot ei}{9} \end{bmatrix} \rightarrow s$$

$$\begin{bmatrix} \frac{ei}{3} & \frac{ei}{6} & 0 & 0 \\ \frac{ei}{6} & \frac{ei}{3} & 0 & 0 \\ 0 & 0 & \frac{4 \cdot ei}{9} & \frac{2 \cdot ei}{9} \\ 0 & 0 & \frac{2 \cdot ei}{9} & \frac{4 \cdot ei}{9} \end{bmatrix}$$

$$\left[\frac{-12 \cdot 12}{8} \quad \frac{12 \cdot 12}{8} \quad \frac{-12 \cdot 3 \cdot 6^2}{12^2} \quad \frac{12 \cdot 3^2 \cdot 6}{12^2} \right]^T \rightarrow fem$$

$$\begin{bmatrix} -18 \\ 18 \\ -9 \\ \frac{9}{2} \end{bmatrix}$$

$$\begin{bmatrix} 18 & -18+9 & \frac{7}{2} \end{bmatrix}^T \rightarrow p \qquad \begin{bmatrix} 18 \\ -9 \\ \frac{7}{2} \\ 2 \end{bmatrix}$$

$$s \cdot a^T \cdot (a \cdot s \cdot a^T)^{-1} \cdot p + fem \qquad \begin{bmatrix} 1.E-12 \\ 25.4423 \\ -25.4423 \\ -10.5577 \end{bmatrix}$$

$$\text{-----} -2 \qquad -2$$

$$\text{solve}\left(\begin{cases} ra+rb=24 \\ 12 \cdot 6-rb \cdot 12+12 \cdot 15+36=0 \end{cases}, \{ra,rb\}\right) \qquad ra=0 \text{ and } rb=24$$

$$[]$$

-----1

1

$$\text{solve} \left(\begin{cases} d1 = (l+x) \cdot s2 \\ d2 = l \cdot s2 \\ d1 = (1.5 \cdot l - x) \cdot s1 \end{cases}, \{s1, s2, d2\} \right)$$

$$d2 = \frac{l \cdot d1}{x+l} \text{ and } s1 = \frac{-d1}{x-1.5 \cdot l} \text{ and } s2 = \frac{d1}{x+l}$$

$$\text{solve} \left(mp \cdot (s1 + s1 + s2) = \frac{q \cdot d1 \cdot (1.5 \cdot l - x)}{2} + q \cdot \left(\frac{d1 \cdot (l+x)}{2} - \frac{d2 \cdot l}{2} \right), q \right) \mid d2 = \frac{l \cdot d1}{x+l} \text{ and } s1 = \frac{-d1}{x-1.5 \cdot l} \text{ and } s2 = \frac{d1}{x+l}$$



$$q = \frac{-0.8 \cdot mp \cdot (x + 3.5 \cdot l)}{l \cdot (x - 1.5 \cdot l) \cdot (x + 0.6 \cdot l)}$$

$$\text{solve} \left(\frac{d}{dx}(q) = 0, x \right) \mid q = \frac{-0.8 \cdot mp \cdot (x + 3.5 \cdot l)}{l \cdot (x - 1.5 \cdot l) \cdot (x + 0.6 \cdot l)}$$

$$x = 0.307887 \cdot l \text{ or } x = -7.30789 \cdot l \text{ or } mp = 0.$$

-----2

2

$$q = \frac{-0.8 \cdot mp \cdot (x + 3.5 \cdot l)}{l \cdot (x - 1.5 \cdot l) \cdot (x + 0.6 \cdot l)} \mid x = 0.30788655293195 \cdot l$$

$$q = \frac{2.81465 \cdot mp}{l^2}$$

