$$p1 := \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} \qquad p2 := \begin{bmatrix} 3 \\ 0 \\ 0 \end{bmatrix} \qquad p3 := \begin{bmatrix} 0 \\ 0 \\ 3 \end{bmatrix} \qquad pL := \begin{bmatrix} 3 \\ 0 \\ 3 \end{bmatrix}$$

$$F := \begin{bmatrix} 0 \\ 6 \\ 0 \end{bmatrix} \qquad M := \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$

$$pCG := \frac{p1 + p2 + p3}{3} \qquad pCG = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$$

$$Mcg := M + (pL - pCG) \times F \qquad Mcg = \begin{bmatrix} -12 \\ 0 \\ 12 \end{bmatrix}$$

$$FF1 := \frac{F}{3} \qquad FF2 := \frac{F}{3} \qquad FF3 := \frac{F}{3}$$

$$FF1 = \begin{bmatrix} 0 \\ 2 \\ 0 \end{bmatrix} \qquad FF2 = \begin{bmatrix} 0 \\ 2 \\ 0 \end{bmatrix} \qquad FF3 = \begin{bmatrix} 0 \\ 2 \\ 0 \end{bmatrix}$$

$$FM1\_x + FM2\_x + FM3\_x = 0$$

$$FM1\_y + FM2\_y + FM3\_y = 0$$

$$FM1\_z + FM2\_z + FM3\_z = 0$$

$$FM1\_z \cdot r1\_y - FM1\_y \cdot r1\_z + FM2\_z \cdot r2\_y - FM2\_y \cdot r2\_z + FM3\_z \cdot r3\_y - FM3\_y \cdot r3\_z = Mcg\_x$$

$$FM1\_x \cdot r1\_z - FM1\_z \cdot r1\_x + FM2\_x \cdot r2\_z - FM2\_z \cdot r2\_x + FM3\_x \cdot r3\_z - FM3\_z \cdot r3\_x = Mcg\_y$$

$$FM1\_y \cdot r1\_x - FM1\_x \cdot r1\_y + FM2\_y \cdot r2\_x - FM2\_x \cdot r2\_y + FM3\_y \cdot r3\_x - FM3\_x \cdot r3\_y = Mcg\_z$$

$$r1 := p1 - pCG \qquad r2 := p2 - pCG \qquad r3 := p3 - pCG \qquad sumsq := (|r1|)^2 + (|r2|)^2 + (|r3|)^2$$

$$r1 = \begin{bmatrix} -1 \\ 0 \\ -1 \end{bmatrix} \qquad r2 = \begin{bmatrix} 2 \\ 0 \\ -1 \end{bmatrix} \qquad r3 = \begin{bmatrix} -1 \\ 0 \\ 2 \end{bmatrix} \qquad sumsq = 12$$

proportionality to the distance from point to CG in XZ plane

$$sumsq\_xz := r1\_x^2 + r1\_z^2 + r2\_x^2 + r2\_z^2 + r3\_x^2 + r3\_z^2 \qquad sumsq\_xz = 12$$

$$FM1\_x\_xz := \frac{Mcg\_y \cdot r1\_z}{sumsq\_xz} \qquad FM1\_x\_xz = 0 \qquad FM1\_z\_xz := \frac{-Mcg\_y \cdot r1\_x}{sumsq\_xz} \qquad FM1\_z\_xz = 0$$

$FM2\_x\_xz := \frac{Mcg\_y \cdot r2\_z}{sumsq\_xz}$ $FM2\_x\_xz = 0$ $FM2\_z\_xz := \frac{-Mcg\_y \cdot r2\_x}{sumsq\_xz}$ $FM2\_z\_xz = 0$

$FM3\_x\_xz := \frac{Mcg\_y \cdot r3\_z}{sumsq\_xz}$ $FM3\_x\_xz = 0$ $FM3\_z\_xz := \frac{-Mcg\_y \cdot r3\_x}{sumsq\_xz}$ $FM3\_z\_xz = 0$

proportionality to the distance from point to CG in XY plane

$sumsq\_xy := r1\_x^2 + r1\_y^2 + r2\_x^2 + r2\_y^2 + r3\_x^2 + r3\_y^2$ $sumsq\_xy = 6$

$FM1\_x\_xy := \frac{-Mcg\_z \cdot r1\_y}{sumsq\_xy}$ $FM1\_x\_xy = 0$ $FM1\_y\_xy := \frac{Mcg\_z \cdot r1\_x}{sumsq\_xy}$ $FM1\_y\_xy = -2$

$FM2\_x\_xy := \frac{-Mcg\_z \cdot r2\_y}{sumsq\_xy}$ $FM2\_x\_xy = 0$ $FM2\_y\_xy := \frac{Mcg\_z \cdot r2\_x}{sumsq\_xy}$ $FM2\_y\_xy = 4$

$FM3\_x\_xy := \frac{-Mcg\_z \cdot r3\_y}{sumsq\_xy}$ $FM3\_x\_xy = 0$ $FM3\_y\_xy := \frac{Mcg\_z \cdot r3\_x}{sumsq\_xy}$ $FM3\_y\_xy = -2$

proportionality to the distance from point to CG in YZ plane

$sumsq\_yz := r1\_y^2 + r1\_z^2 + r2\_y^2 + r2\_z^2 + r3\_y^2 + r3\_z^2$ $sumsq\_yz = 6$

$FM1\_y\_yz := \frac{-Mcg\_x \cdot r1\_z}{sumsq\_yz}$ $FM1\_y\_yz = -2$ $FM1\_z\_yz := \frac{Mcg\_x \cdot r1\_y}{sumsq\_yz}$ $FM1\_z\_yz = 0$

$FM2\_y\_yz := \frac{-Mcg\_x \cdot r2\_z}{sumsq\_yz}$ $FM2\_y\_yz = -2$ $FM2\_z\_yz := \frac{Mcg\_x \cdot r2\_y}{sumsq\_yz}$ $FM2\_z\_yz = 0$

$FM3\_y\_yz := \frac{-Mcg\_x \cdot r3\_z}{sumsq\_yz}$ $FM3\_y\_yz = 4$ $FM3\_z\_yz := \frac{Mcg\_x \cdot r3\_y}{sumsq\_yz}$ $FM3\_z\_yz = 0$

Adding it all up

$$FM1 := \begin{bmatrix} FM1\_x\_xz + FM1\_x\_xy \\ FM1\_y\_yz + FM1\_y\_xy \\ FM1\_z\_xz + FM1\_z\_yz \end{bmatrix} \quad FM2 := \begin{bmatrix} FM2\_x\_xz + FM2\_x\_xy \\ FM2\_y\_yz + FM2\_y\_xy \\ FM2\_z\_xz + FM2\_z\_yz \end{bmatrix} \quad FM3 := \begin{bmatrix} FM3\_x\_xz + FM3\_x\_xy \\ FM3\_y\_yz + FM3\_y\_xy \\ FM3\_z\_xz + FM3\_z\_yz \end{bmatrix}$$

$$FM1 = \begin{bmatrix} 0 \\ -4 \\ 0 \end{bmatrix} \quad FM2 = \begin{bmatrix} 0 \\ 2 \\ 0 \end{bmatrix} \quad FM3 = \begin{bmatrix} 0 \\ 2 \\ 0 \end{bmatrix}$$

$FM1\_z \cdot r1\_y - FM1\_y \cdot r1\_z + FM2\_z \cdot r2\_y - FM2\_y \cdot r2\_z + FM3\_z \cdot r3\_y - FM3\_y \cdot r3\_z = -6$ $Mcg\_x = -12$

$FM1\_x \cdot r1\_z - FM1\_z \cdot r1\_x + FM2\_x \cdot r2\_z - FM2\_z \cdot r2\_x + FM3\_x \cdot r3\_z - FM3\_z \cdot r3\_x = 0$ $Mcg\_y = 0$

$FM1\_y \cdot r1\_x - FM1\_x \cdot r1\_y + FM2\_y \cdot r2\_x - FM2\_x \cdot r2\_y + FM3\_y \cdot r3\_x - FM3\_x \cdot r3\_y = 6$ $Mcg\_z = 12$