Determine beam thickness $\qquad$ $\mathrm{ORIGIN} := 0$

$l := 16\ ft + 2\ in$ $\qquad$ Foundation length

Number of point loads: $\qquad$ $p := 5$

Point Load	Point load location
$P_1 := 1\ kip$	$y_1 := 32.333\ in$
$P_2 := 1\ kip$	$y_2 := 64.666\ in$
$P_3 := 1\ kip$	$y_3 := 96.999\ in$
$P_4 := 1\ kip$	$y_4 := 129.332\ in$
$P_5 := 1\ kip$	$y_5 := 161.665\ in$

Distributed Load and duration

Number of distributed loads: $\qquad$ $z := 1$

Start Load	End Load	Load start from R1	Load end from R1
$ws_1 := 1\ \dfrac{kip}{ft}$	$we_1 := 1\ \dfrac{kip}{ft}$	$zs_1 := 0\ ft$	$ze_1 := l$

Beam Equation

Reactions

$$R_1 := \frac{1}{l} \cdot \left(P \cdot (l - y) + \sum_{zz=1}^{z} \left(.5 \cdot \left(ws_{zz} + we_{zz} \right) \cdot \left(ze_{zz} - zs_{zz} \right) \cdot \left(l - \left(0.5 \cdot \left(ze_{zz} + zs_{zz} \right) \right) \right) \right) \right) = 10.583\ kip$$

$$R_2 := \frac{1}{l} \cdot \left(P \cdot y + \sum_{zz=1}^{z} \left(.5 \cdot \left(ws_{zz} + we_{zz} \right) \cdot \left(ze_{zz} - zs_{zz} \right) \cdot \left(0.5 \cdot \left(ze_{zz} + zs_{zz} \right) \right) \right) \right) = 10.583\ kip$$

Shear Equation

Left reaction

$V_{R1}(x) := R_1 \cdot \mathrm{if}(0 \le x \le l, 1, 0)$ $\qquad$ $R_1 = 10.583\ kip$ $\qquad$ $R_2 = 10.583\ kip$

Shear loads due to point loads $\qquad$ $R_1 + R_2 = 21.167\ kip$

$V_{pn}(n, x) := -P_n \cdot \neg\left(0 \le x < y_n\right)$

Total shear load from point loads

$$V_p(x) := \sum_{n=1}^{p} V_{pn}(n, x)$$

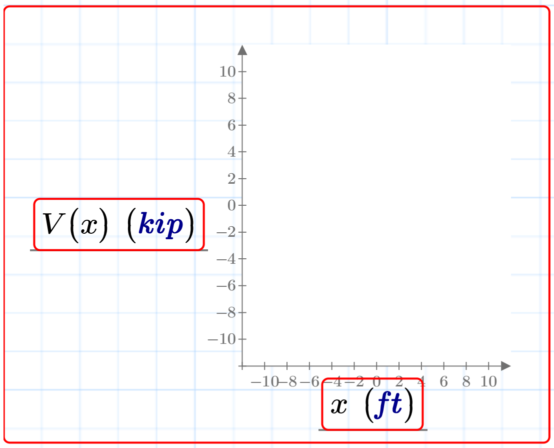
Shear loads from distributed loads

$$V_{dn}(n,x) := \begin{cases} 0 & \text{if } 0 \le x < zs_n \\ -(0.5 \cdot (ws_n + we_n)) \cdot (x - zs_n) & \text{else if } zs_n \le x \le ze_n \\ -(0.5 \cdot (ws_n + we_n)) \cdot (ze_n - zs_n) & \text{else} \end{cases}$$

$$V_d(x) := \sum_{n=1}^{z} V_{dn}(n,x)$$

Shear Equation

$$V(x) := V_{R1}(x) + V_p(x) + V_d(x)$$



$Nmax := 1000$

$j := 1 .. Nmax$

$x1 := 0 \qquad x2 := l$

$$xv_j := x1 + j \cdot \frac{x2 - x1}{Nmax}$$

$Vv_j := \text{abs}(V(xv_j))$

$V_{max} := \max(Vv) = 10.583\ \textit{kip}$

$x_{max} := \text{lookup}(V_{max}, Vv, xv)_0 = 4.928\ \textit{m}$

$V(x) := \text{filterNaN}(V(x))$