

Givens:

$$F_1 := 25 \text{ lbf} \quad F_2 := 36 \text{ lbf} \quad F_3 := 60 \text{ lbf}$$

$$E := 60 \text{ ksi} \quad w_{base} := .5 \cdot \text{in}$$

$$l := 5.5 \cdot \text{in} \quad h := .75 \cdot \text{in} \quad \theta := 1.3 \cdot \text{deg} \quad y_p(h) := \frac{h}{2}$$

Work:

$$w(x, \theta) := w_{base} - 2 \cdot x \cdot \tan(\theta) \quad w_{tail} := w(l, \theta) = 0.25 \text{ in}$$

$$Volume := \frac{w_{base} + w_{tail}}{2} \cdot l \cdot h = 1.548 \text{ in}^3 \quad cost := 1.18 \cdot \frac{\text{\$}}{\text{in}^3} \cdot Volume = 1.826 \text{ \$}$$

$$I(x, \theta, h) := \frac{w(x, \theta) \cdot h^3}{12} \quad I_{base} := I(0 \text{ in}, \theta, h) = 0.018 \text{ in}^4$$

$$I_{tail} := I(l, \theta, h) = 0.009 \text{ in}^4$$

$$M(x, l, F) := F \cdot (l - x)$$

$$\sigma(x, \theta, h, l, F) := \frac{M(x, l, F) \cdot y_p(h)}{I(x, \theta, h)} \quad \sigma_{max} := \sigma(0 \text{ in}, \theta, h, l, F_1) = 2.933 \text{ ksi}$$

$$\sigma_{max} := \sigma(0 \text{ in}, \theta, h, l, F_2) = 4.224 \text{ ksi}$$

$$\sigma_{max} := \sigma(0 \text{ in}, \theta, h, l, F_3) = 7.04 \text{ ksi}$$

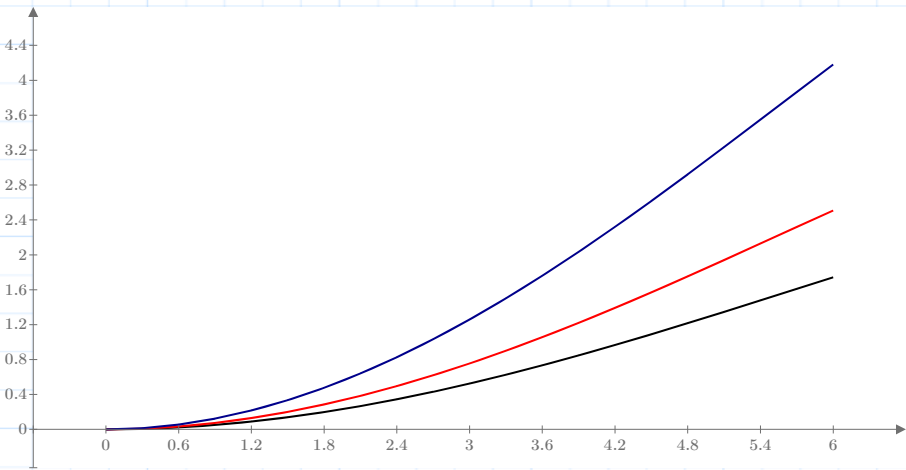
$$\delta(x, F) := \int_{0 \text{ in}}^x \int_{0 \text{ in}}^x \frac{M(x, l, F)}{E \cdot I(x, \theta, h)} dx dx$$

$$\delta_{max} := \delta(l, F_1) = 1.523 \text{ in}$$

$$\delta_{max} := \delta(l, F_2) = 2.193 \text{ in}$$

$$\delta_{max} := \delta(l, F_3) = 3.655 \text{ in}$$

$x := 0 \text{ in}, .3 \text{ in}..6 \text{ in}$

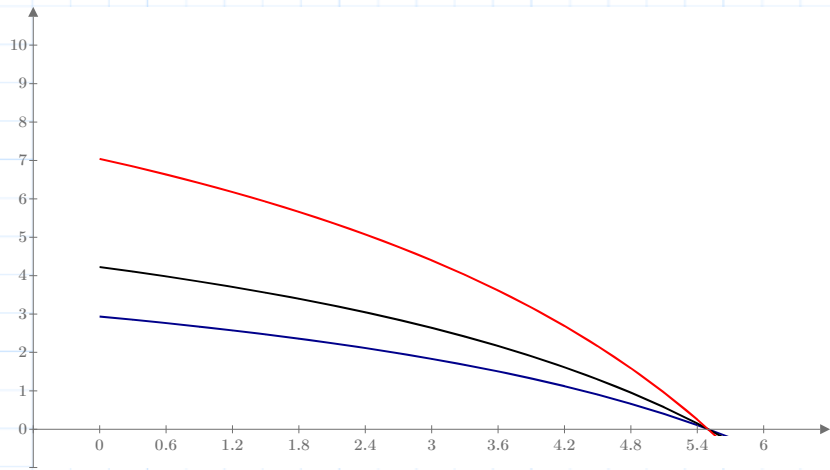


$\delta(x, F_1)$ (in)

$\delta(x, F_2)$ (in)

$\delta(x, F_3)$ (in)

x (in)



$\sigma(x, \theta, h, l, F_1)$ (ksi)

$\sigma(x, \theta, h, l, F_2)$ (ksi)

$\sigma(x, \theta, h, l, F_3)$ (ksi)

x (in)

D: Static Structural

Total Deformation

Type: Total Deformation

Unit: in

Time: 1

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ANSYS
R15.0

