

Condition	Loading	δ at x	θ at x	Equation $y = f(x)$
Simply supported beam with a point load P at the center $a = b = L/2$		$\delta = \frac{Pbx^2}{6EI} \left(\frac{x^2}{2} - a \right)$	$\theta = \frac{Pbx}{2EI} (x - a)$	$y = \frac{Px^2}{6EI} \left(\frac{x^2}{2} - a \right)$
Simply supported beam with a uniformly distributed load w		$\delta = \frac{wx^2}{24EI} (x^2 - 2ax + a^2)$	$\theta = \frac{wx}{6EI} (x^2 - ax)$	$y = \frac{wx^4}{24EI} \left(\frac{x^2}{2} - ax + a^2 \right)$
Fixed-fixed beam with a point load P at the center $a = b = L/2$		$\delta = \frac{Pbx^2}{6EI} \left(\frac{x^2}{2} - a \right) + \frac{Pab^2}{6EI} \left(\frac{x^2}{2} - a \right)$	$\theta = \frac{Pbx}{2EI} (x - a) + \frac{Pab}{2EI} (x - a)$	$y = \frac{Px^2}{6EI} \left(\frac{x^2}{2} - a \right) + \frac{Pab^2}{6EI} \left(\frac{x^2}{2} - a \right)$
Fixed-fixed beam with a uniformly distributed load w		$\delta = \frac{wx^2}{24EI} (x^2 - 2ax + a^2) + \frac{wab^2}{24EI} (x^2 - 2ax + a^2)$	$\theta = \frac{wx}{6EI} (x^2 - ax) + \frac{wab}{6EI} (x^2 - ax)$	$y = \frac{wx^4}{24EI} \left(\frac{x^2}{2} - ax + a^2 \right) + \frac{wab^2}{24EI} \left(\frac{x^2}{2} - ax + a^2 \right)$

Structural Engineering Formulas

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