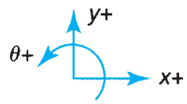
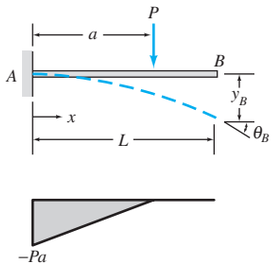
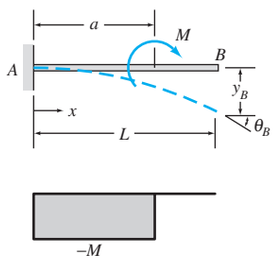
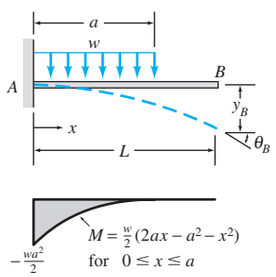
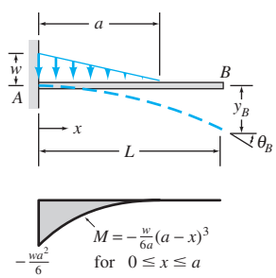
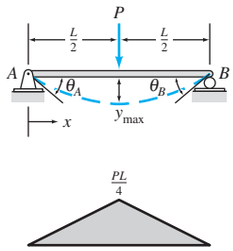
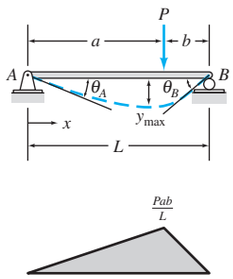
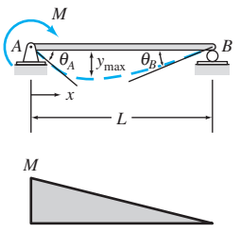
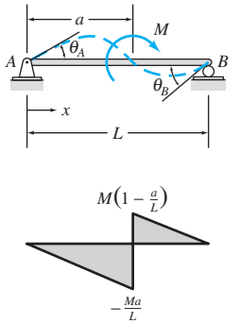
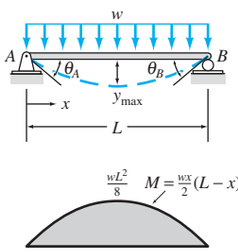
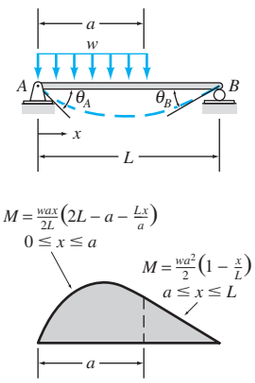
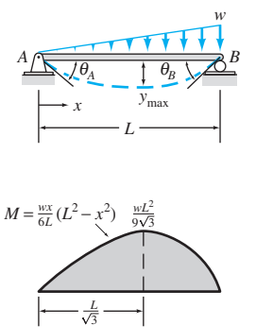
BENDING MOMENTS, SLOPES, AND DEFLECTIONS OF BEAMS UNDER VARIOUS LOADING CONDITIONS



Beam, Loading, and Bending Moment Diagram	Equations for Slope and Deflection
	$0 \le x \le a$: $\theta = \frac{P}{2EI}(x^2 - 2ax)$ $y = \frac{P}{6EI}(x^3 - 3ax^2)$ $a \le x \le L$: $\theta = -\frac{Pa^2}{2EI}$ $y = \frac{Pa^2}{6EI}(a - 3x)$ $\theta_B = -\frac{Pa^2}{2EI}$; $y_B = -\frac{Pa^2}{6EI}(3L - a)$
	$0 \le x \le a$: $\theta = -\frac{Mx}{EI}$ $y = -\frac{Mx^2}{2EI}$ $a \le x \le L$: $\theta = -\frac{Ma}{EI}$ $y = \frac{Ma}{2EI}(a - 2x)$ $\theta_B = -\frac{Ma}{EI}$; $y_B = -\frac{Ma}{2EI}(2L - a)$
	$0 \le x \le a$: $\theta = \frac{w}{6EI}(3ax^2 - 3a^2x - x^3)$ $y = \frac{w}{24EI}(4ax^3 - 6a^2x^2 - x^4)$ $a \le x \le L$: $\theta = -\frac{wa^3}{6EI}$ $y = \frac{wa^3}{24EI}(a - 4x)$ $\theta_B = -\frac{wa^3}{6EI}$; $y_B = -\frac{wa^3}{24EI}(4L - a)$
	$0 \le x \le a$: $\theta = \frac{w}{24EIa}(x^4 - 4ax^3 + 6a^2x^2 - 4a^3x)$ $y = \frac{w}{120EIa}(x^5 - 5ax^4 + 10a^2x^3 - 10a^3x^2)$ $a \le x \le L$: $\theta = -\frac{wa^3}{24EI}$ $y = \frac{wa^3}{120EI}(-5x + a)$ $\theta_B = -\frac{wa^3}{24EI}$; $y_B = -\frac{wa^3}{120EI}(5L - a)$

Beam, Loading, and Bending Moment Diagram	Equations for Slope and Deflection
	$0 \le x \le \frac{L}{2}$: $\theta = \frac{P}{16EI}(4x^2 - L^2)$ $y = \frac{P}{48EI}(4x^3 - 3L^2x)$ $\theta_A = -\frac{PL^2}{16EI}; \quad \theta_B = \frac{PL^2}{16EI}$ $y_{\max} = -\frac{PL^3}{48EI}$
	$0 \le x \le a$: $\theta = \frac{Pb}{6EIL}(3x^2 + b^2 - L^2)$ $y = \frac{Pb}{6EIL}(x^3 + b^2x - L^2x)$ $a \le x \le L$: $\theta = \frac{Pa}{6EIL}[L^2 - a^2 - 3(L - x)^2]$ $y = \frac{Pa(L-x)}{6EIL}(x^2 + a^2 - 2Lx)$ $\theta_A = -\frac{Pb}{6EIL}(L^2 - b^2)$ $\theta_B = \frac{Pa}{6EIL}(L^2 - a^2)$ For $a \ge b$: $y_{\max} = -\frac{Pb}{9\sqrt{3}EIL}(L^2 - b^2)^{3/2}$ at $x = \left(\frac{L^2 - b^2}{3}\right)^{1/2}$
	$\theta = -\frac{M}{6EIL}(3x^2 - 6Lx + 2L^2)$ $y = -\frac{M}{6EIL}(x^3 - 3Lx^2 + 2L^2x)$ $\theta_A = -\frac{ML}{3EI}; \quad \theta_B = \frac{ML}{6EI}$ $y_{\max} = -\frac{ML^2}{9\sqrt{3}EI}$ at $x = L\left(1 - \frac{1}{\sqrt{3}}\right)$

Beam, Loading, and Bending Moment Diagram	Equations for Slope and Deflection
	$0 \le x \le a$: $\theta = \frac{M}{6EIL}(-3x^2 + 6aL - 3a^2 - 2L^2)$ $y = \frac{M}{6EIL}(-x^3 + 6aLx - 3a^2x - 2L^2x)$ $\theta_A = \frac{M}{6EIL}(6aL - 3a^2 - 2L^2)$ $\theta_B = \frac{M}{6EIL}(L^2 - 3a^2)$
	$\theta = -\frac{w}{24EI}(4x^3 - 6Lx^2 + L^3)$ $y = -\frac{w}{24EI}(x^4 - 2Lx^3 + L^3x)$ $\theta_A = -\frac{wL^3}{24EI}$ $\theta_B = \frac{wL^3}{24EI}$ $y_{max} = -\frac{5wL^4}{384EI}$ at $x = \frac{L}{2}$
	$0 \le x \le a$: $\theta = -\frac{w}{24EIL}[4Lx^3 - 6a(2L-a)x^2 + a^2(2L-a)^2]$ $y = -\frac{w}{24EIL}[Lx^4 - 2a(2L-a)x^3 + a^2(2L-a)^2x]$ $a \le x \le L$: $\theta = -\frac{wa^2}{24EIL}(6x^2 - 12Lx + a^2 + 4L^2)$ $y = -\frac{wa^2}{24EIL}(L-x)(-2x^2 + 4Lx - a^2)$ $\theta_A = -\frac{wa^2}{24EIL}(2L-a)^2$ $\theta_B = \frac{wa^2}{24EIL}(2L^2 - a^2)$
	$\theta = -\frac{w}{360EIL}(15x^4 - 30L^2x^2 + 7L^4)$ $y = -\frac{w}{360EIL}(3x^5 - 10L^2x^3 + 7L^4x)$ $\theta_A = -\frac{7wL^3}{360EI}$ $\theta_B = \frac{wL^3}{45EI}$ $y_{max} = -0.00652\frac{wL^4}{EI}$ at $x = 0.5193L$

FIXED-END MOMENTS