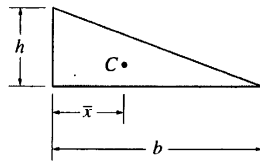


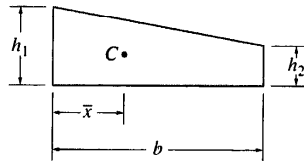
Geometric Properties of Areas



Triangle

$$A = \frac{1}{2}bh$$

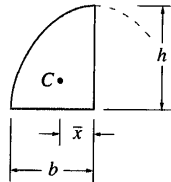
$$\bar{x} = \frac{1}{3}b$$



Trapezoid

$$A = \frac{1}{2}b(h_1 + h_2)$$

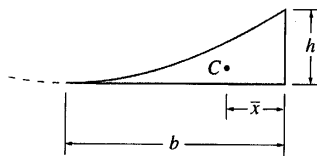
$$\bar{x} = \frac{b(2h_2 + h_1)}{3(h_1 + h_2)}$$



Semi Parabola

$$A = \frac{2}{3}bh$$

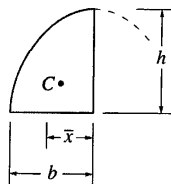
$$\bar{x} = \frac{3}{8}b$$



Parabolic spandrel

$$A = \frac{1}{3}bh$$

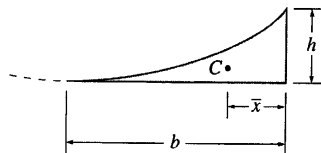
$$\bar{x} = \frac{1}{4}b$$



Semi-segment of n th degree curve

$$A = bh \left(\frac{n}{n+1} \right)$$

$$\bar{x} = \frac{b(n+1)}{2(n+2)}$$



Spandrel of n th degree curve

$$A = bh \left(\frac{1}{n+1} \right)$$

$$\bar{x} = \frac{b}{(n+2)}$$

Frequently Used Area Properties

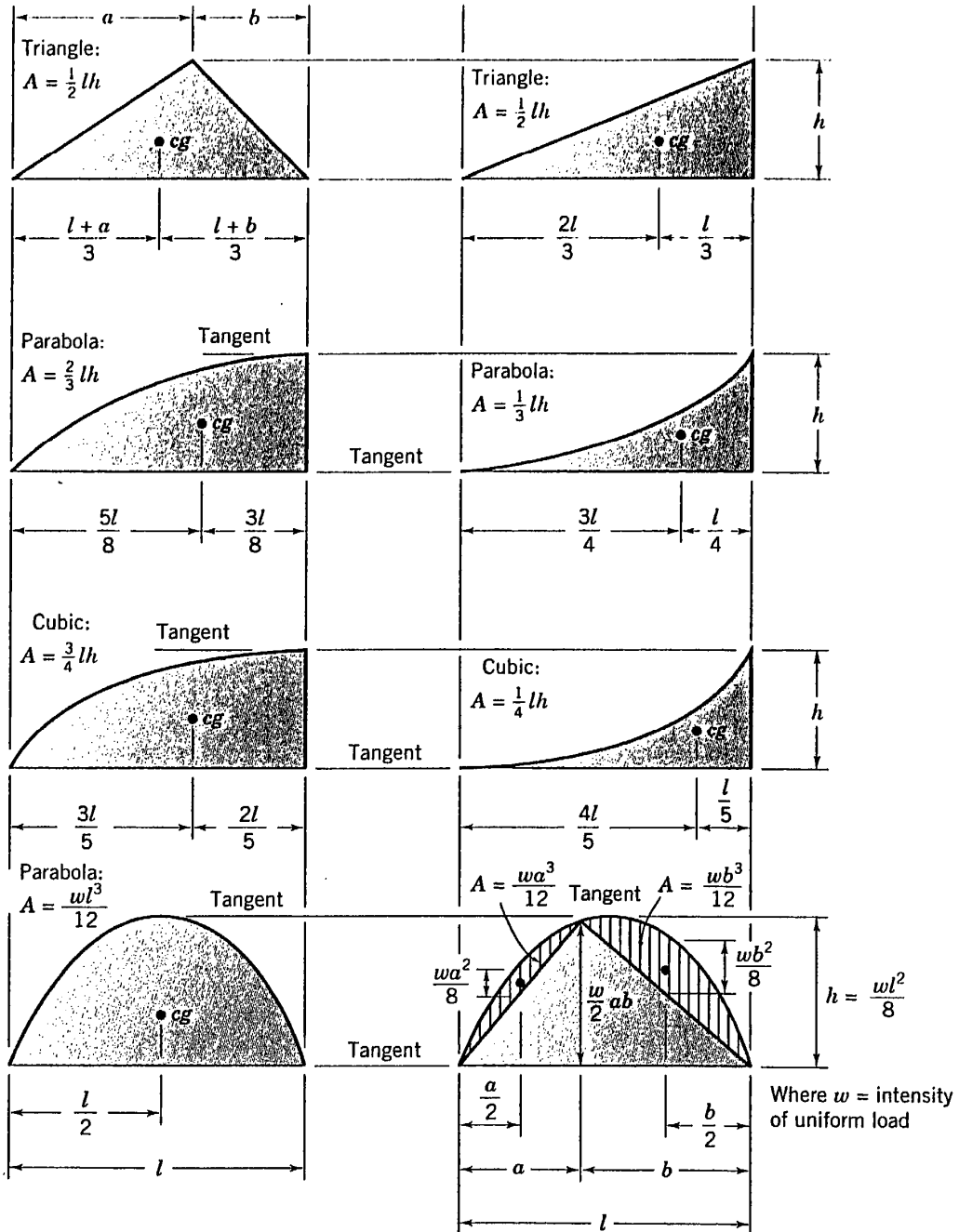
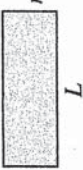
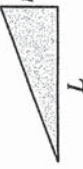





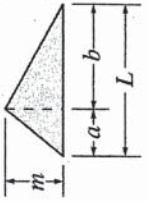



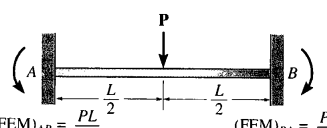
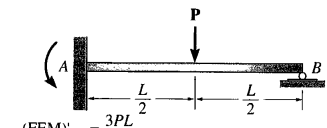
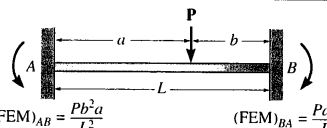
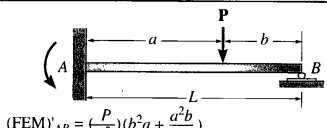
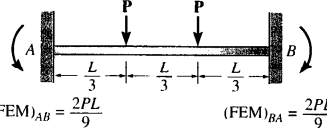
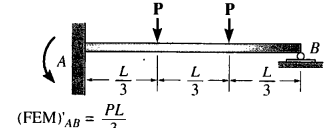
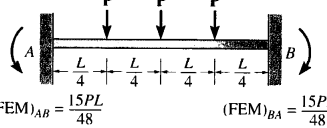
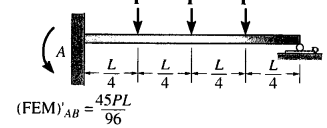
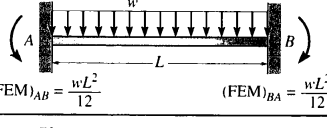
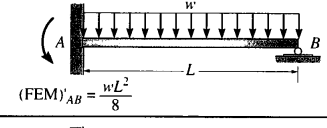
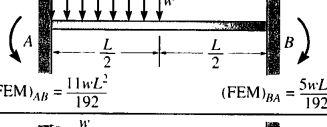
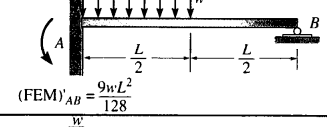
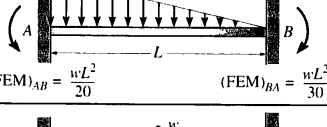
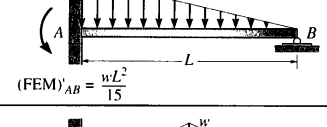
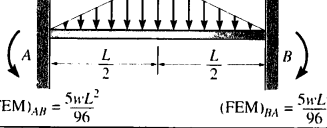
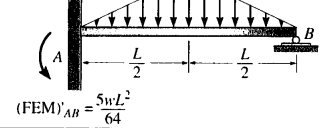
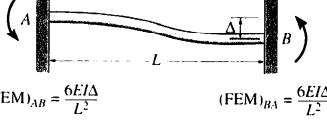
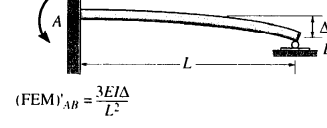
Table for Evaluating $\int_0^L m m' dx$

$\int_0^L m m' dx$				
	$mm'L$	$\frac{1}{2}mm'L$	$\frac{1}{2}m(m_1 + m_2)L$	$\frac{2}{3}mm'L$
	$\frac{1}{2}mm'L$	$\frac{1}{3}mm'L$	$\frac{1}{6}m(m_1 + 2m_2)L$	$\frac{5}{12}mm'L$
	$\frac{1}{2}m'(m_1 + m_2)L$	$\frac{1}{6}m'(m_1 + 2m_2)L$	$\frac{1}{6}[m_1(2m_1 + m_2) + m_2(m_1 + 2m_2)]L$	$\frac{1}{12}[m'(3m_1 + 5m_2)]L$
	$\frac{1}{2}mm'L$	$\frac{1}{6}mm'(L + a)$	$\frac{1}{6}m[m_1(L + b) + m_2(L + a)]$	$\frac{1}{12}mm'\left(3 + \frac{3a}{L} - \frac{a^2}{L^2}\right)L$
	$\frac{1}{2}mm'L$	$\frac{1}{6}mm'L$	$\frac{1}{6}m(2m_1 + m_2)L$	$\frac{1}{4}mm'L$

$$M_{NF} = \frac{4EI}{L} \theta_N + \frac{2EI}{L} \theta_F - \frac{6EI}{L} \frac{\Delta}{L} + FEM_{NF}$$

$$M_{NF} = \frac{3EI}{L} \theta_N - \frac{3EI}{L} \frac{\Delta}{L} + FEM_{NF}^*$$

Fixed End Moments

 <p> $(FEM)_{AB} = \frac{PL}{8}$ $(FEM)_{BA} = \frac{PL}{8}$ </p>	 <p> $(FEM)_{AB} = \frac{3PL}{16}$ </p>
 <p> $(FEM)_{AB} = \frac{Pb^2a}{L^2}$ $(FEM)_{BA} = \frac{Pa^2b}{L^2}$ </p>	 <p> $(FEM)_{AB} = \left(\frac{P}{L^2}\right)(b^2a + \frac{a^2b}{2})$ </p>
 <p> $(FEM)_{AB} = \frac{2PL}{9}$ $(FEM)_{BA} = \frac{2PL}{9}$ </p>	 <p> $(FEM)_{AB} = \frac{PL}{3}$ </p>
 <p> $(FEM)_{AB} = \frac{15PL}{48}$ $(FEM)_{BA} = \frac{15PL}{48}$ </p>	 <p> $(FEM)_{AB} = \frac{45PL}{96}$ </p>
 <p> $(FEM)_{AB} = \frac{wL^2}{12}$ $(FEM)_{BA} = \frac{wL^2}{12}$ </p>	 <p> $(FEM)_{AB} = \frac{wL^2}{8}$ </p>
 <p> $(FEM)_{AB} = \frac{11wL^2}{192}$ $(FEM)_{BA} = \frac{5wL^2}{192}$ </p>	 <p> $(FEM)_{AB} = \frac{9wL^2}{128}$ </p>
 <p> $(FEM)_{AB} = \frac{wL^2}{20}$ $(FEM)_{BA} = \frac{wL^2}{30}$ </p>	 <p> $(FEM)_{AB} = \frac{wL^2}{15}$ </p>
 <p> $(FEM)_{AB} = \frac{5wL^2}{96}$ $(FEM)_{BA} = \frac{5wL^2}{96}$ </p>	 <p> $(FEM)_{AB} = \frac{5wL^2}{64}$ </p>
 <p> $(FEM)_{AB} = \frac{6EI\Delta}{L^2}$ $(FEM)_{BA} = \frac{6EI\Delta}{L^2}$ </p>	 <p> $(FEM)_{AB} = \frac{3EI\Delta}{L^2}$ </p>