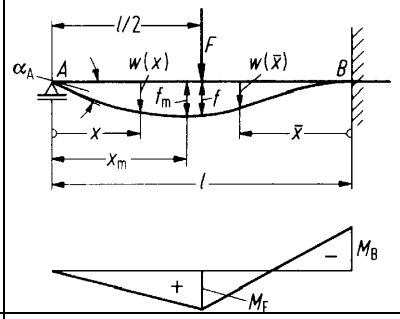
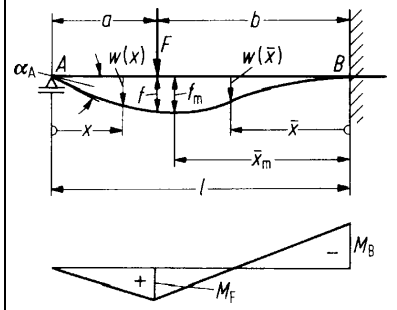
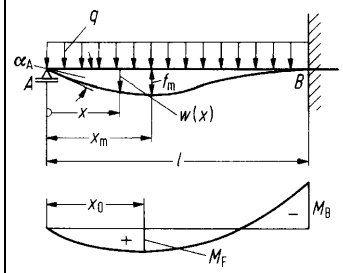
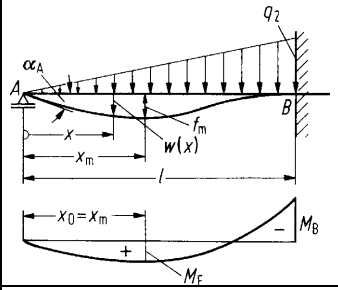
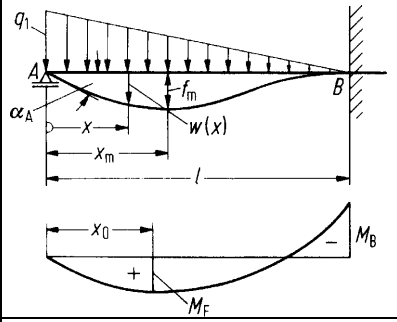
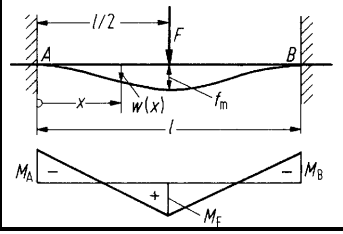
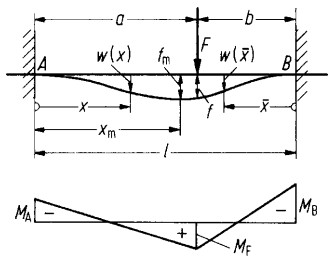
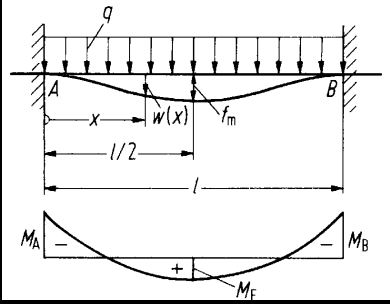
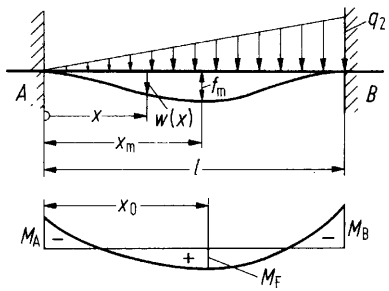
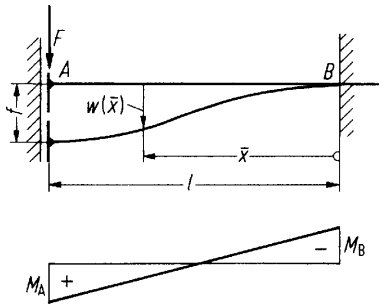
Tabelle 5b. Biegemomente und Biegelinien von statisch unbestimmten Trägern mit konstantem Querschnitt

	Belastungsfall	Gleichung der Biegelinie	Auflagekräfte Biegemomente	Durchbiegung	Neigungswinkel
1		$0 \le x \le l/2$: $w(x) = \frac{Fl^3}{96EI_y}\left[3\frac{x}{l} - 5\left(\frac{x}{l}\right)^3\right]$ $0 \le \bar{x} \le l/2$: $w(\bar{x}) = \frac{Fl^3}{96EI_y}\left[9\left(\frac{\bar{x}}{l}\right)^2 - 11\left(\frac{\bar{x}}{l}\right)^3\right]$	$F_A = \frac{5}{16}F,\ F_B = \frac{11}{16}F$ $M_B = -\frac{3}{16}Fl$ $M_F = \frac{5}{32}Fl$	$f = \frac{7}{768}\frac{Fl^3}{EI_y}$ $f_m = \frac{Fl^3}{48\sqrt{5}EI_y}$ in $x_m = \frac{l}{\sqrt{5}} = 0{,}447l$	$\alpha_A = \frac{Fl^2}{32EI_y}$
2		$0 \le x \le a$: $w(x) = \frac{Flb^2}{4EI_y}\left[\frac{a}{l}\frac{x}{l} - \frac{2}{3}\left(1+\frac{a}{2l}\right)\left(\frac{x}{l}\right)^3\right]$ $0 \le \bar{x} \le b$: $w(\bar{x}) = \frac{Fl^2a}{4EI_y}\cdot$ $\left[\left(1-\frac{a^2}{l^2}\right)\left(\frac{\bar{x}}{l}\right)^2 - \left(1-\frac{a^2}{3l^2}\right)\left(\frac{\bar{x}}{l}\right)^3\right]$	$F_A = F\left(\frac{b}{l}\right)^2\left(1+\frac{a}{2l}\right)$ $F_B = F\left(\frac{a}{l}\right)^2\left(1+\frac{b}{2l}+\frac{3}{2}\frac{b}{a}\right)$ $M_B = -F\frac{ab}{l}\left(1-\frac{b}{2l}\right)$ $M_F = F\frac{ab^2}{l^2}\left(1+\frac{a}{2l}\right)$	$f = \frac{Fa^2b^3}{4EI_yl^2}\left(1+\frac{a}{3l}\right)$ für $a \le 0{,}414l$: $f_m = w(\bar{x}_m)$ in $\bar{x}_m = \frac{b(1+l/a)}{1+3b/2a+b/2l}$ für $a \ge 0{,}414l$: $f_m = w(x_m)$ in $x_m = l\sqrt{\frac{a/2l}{1+a/2l}}$	$\alpha_A = \frac{Fab^2}{4EI_yl}$
3		$w(x) = \frac{ql^4}{48EI_y}\left[\frac{x}{l} - 3\left(\frac{x}{l}\right)^3 + 2\left(\frac{x}{l}\right)^4\right]$	$F_A = \frac{3}{8}ql,\ F_B = \frac{5}{8}ql$ $M_B = -\frac{1}{8}ql^2$ $M_F = \frac{9}{128}ql^2$ in $x_0 = \frac{3}{8}l$	$f_m = \frac{ql^4}{185EI_y}$ in $x_m = 0{,}4215l$	$\alpha_A = \frac{ql^3}{48EI_y}$

4		$w(x) = \frac{q_2 l^4}{120 EI_y}\left[\frac{x}{l} - 2\left(\frac{x}{l}\right)^3 + \left(\frac{x}{l}\right)^5\right]$	$F_A = \frac{1}{10} q_2 l,\ F_B = \frac{4}{10} q_2 l$ $M_B = -\frac{1}{15} q_2 l^2$ $M_F = 0{,}0298\, q_2 l^2$ in $x_0 = \frac{l}{\sqrt{5}} = 0{,}447 l$	$f_m = \frac{q_2 l^4}{419 EI_y}$ in $x_m = \frac{l}{\sqrt{5}} = 0{,}447 l$	$\alpha_A = \frac{q_2 l^3}{120 EI_y}$
5		$w(x) = \frac{q_1 l^4}{240 EI_y} \cdot$ $\left[3\frac{x}{l} - 11\left(\frac{x}{l}\right)^3 + 10\left(\frac{x}{l}\right)^4 - 2\left(\frac{x}{l}\right)^5\right]$	$F_A = \frac{11}{40} q_1 l, F_B = \frac{9}{40} q_1 l$ $M_B = -\frac{7}{120} q_1 l^2$ $M_F = 0{,}0423\, q_1 l^2$ in $x_0 = 0{,}329 l$	$f_m = \frac{q_1 l^4}{328 EI_y}$ in $x_m = 0{,}4025 l$	$\alpha_A = \frac{q_1 l^3}{80 EI_y}$
6		$0 \le x \le l/2$: $w(x) = \frac{F l^3}{48 EI_y}\left[3\left(\frac{x}{l}\right)^2 - 4\left(\frac{x}{l}\right)^3\right]$	$F_A = F_B = \frac{1}{2} F$ $M_A = M_B = -\frac{1}{8} F l$ $M_F = \frac{1}{8} F l$	$f_m = \frac{F l^3}{192 EI_y}$	-------

7		$0 \le x \le a$: $w(x) = \frac{Flb^2}{6EI_y}\left[3\frac{a}{l}\left(\frac{x}{l}\right)^2 - \left(1+\frac{2a}{l}\right)\left(\frac{x}{l}\right)^3\right]$ $0 \le \bar{x} \le b$: $w(\bar{x}) = \frac{Fla^2}{6EI_y}\left[3\frac{b}{l}\left(\frac{\bar{x}}{l}\right)^2 - \left(1+\frac{2b}{l}\right)\left(\frac{\bar{x}}{l}\right)^3\right]$	$F_A = F\left(\frac{b}{l}\right)^2\left(1+2\frac{a}{l}\right)$ $F_B = F\left(\frac{a}{l}\right)^2\left(1+2\frac{b}{l}\right)$ $M_A = -Fa\left(\frac{b}{l}\right)^2$ $M_B = -Fb\left(\frac{a}{l}\right)^2$ $M_F = 2Fl\left(\frac{a}{l}\right)^2\left(\frac{b}{l}\right)^2$	$f = \frac{Fa^3b^3}{3EI_y l^3}$ $a > b$: $f_m = \frac{2}{3}\frac{Fa^3b^2}{EI_y l^2}\left(\frac{1}{1+2a/l}\right)^2$ in $x_m = l\frac{1}{1+l/2a}$ $a < b$: $f_m = \frac{2}{3}\frac{Fa^2b^3}{EI_y l^2}\left(\frac{1}{1+2b/l}\right)^2$ in $x_m = l\frac{1}{1+l/2b}$	-------
8		$w(x) = \frac{ql^4}{24EI_y}\left[\left(\frac{x}{l}\right)^2 - 2\left(\frac{x}{l}\right)^3 + \left(\frac{x}{l}\right)^4\right]$	$F_A = F_B = \frac{1}{2}ql$ $M_A = M_B = -\frac{1}{12}ql^2$ $M_F = \frac{1}{24}ql^2$	$f = \frac{ql^4}{384EI_y}$	-------

9		$w(x) = \frac{q_2 l^4}{120 EI_y}\left[2\left(\frac{x}{l}\right)^2 - 3\left(\frac{x}{l}\right)^3 + \left(\frac{x}{l}\right)^5\right]$	$F_A = \frac{3}{20} q_2 l$ $F_B = \frac{7}{20} q_2 l$ $M_A = -\frac{1}{30} q_2 l^2$ $M_B = -\frac{1}{20} q_2 l^2$ $M_F = 0{,}0214\, q_2 l^2$ in $x_0 = l\sqrt{\frac{3}{10}} = 0{,}548 l$	$f_m = \frac{q_2 l^4}{764 EI_y}$ in $x_m = 0{,}525 l$	-------
10		$w(\bar{x}) = \frac{Fl^3}{12 EI_y}\left[3\left(\frac{\bar{x}}{l}\right)^2 - 2\left(\frac{\bar{x}}{l}\right)^3\right]$	$F_A = 0,\ F_B = F$ $M_A = \frac{1}{2} Fl$ $M_B = -\frac{1}{2} Fl$	$f = \frac{Fl^3}{12 EI_y}$	-------