

*arc tangent*

*arc tangent*

*beam tangent*

$d_1$

$d_1$

$d_1$

$$d_1^*$$

$$d_1^\perp$$

$$d_1^{\parallel}$$

$$d_1^\perp$$

$d_1^{\parallel}$



$\overline{d}_1$

$d_2$

$$d_2^*$$

$$d_2^\perp$$

$d_2^{\parallel}$

$$d_2^\perp$$

$d_2^{\parallel}$

$d_3$



$$d\theta = \kappa ds$$

$$d\theta_1 = \kappa_1 ds$$

$$d\theta_2 = \kappa_2 ds$$

$$d\theta_3 = \tau ds$$

$e_0$

$e_1$

$$e_{2i+1}$$

$e_{2i-1}$



$e_{2i-2}$

$e_{2i}$

$e_{i+1}$

$e_{i+1}$

$e_{i-1}$

$e_{i-2}$

$e_i$

$e_{n-1}$



$e_{n-2}$

$$\boldsymbol{F}(s+ds)$$

$$-F(s)$$

$f(s)$

*ghost*

*handle*

$$\kappa_1 d_1$$

$$\kappa_1 d_1$$

$$\kappa_1 d_1$$

$$\kappa_2 d_2$$



*Kb*

$\kappa b_0$

$\kappa b_1$

$$\kappa b_{2i+1}$$

$\kappa b_{2i-1}$

$$\kappa b_{2i}^+$$

$\kappa b_{2i}^-$

$$\kappa b_{i+1}$$



$$\kappa b_{i-1}$$

$\kappa b_i$

$$\kappa b_{n-1}$$

$\kappa b_{n-2}$

$$M_1(s+ds)$$

$$-M_1(s)$$

$$-M_1(s)$$

$$M_2(s+ds)$$

$$-M_2(s)$$



$$\boldsymbol{M}(s+ds)$$

$$-M(s)$$

$$M(s)$$

$m(s)$

$$N(s+ds)$$

$$-N(s)$$

$$-N$$

$$Q(s+ds)$$

$$-Q(s)$$

$$s + ds$$





50

$s_1$

$s_1$

$s_1$

$s_{i+1}$

$s_{i-1}$

$s_{i-1}$

$S_i$

$s_{n-1}$

$s_n$



$S_t$

$$\mathbf{T}_1(s+ds)$$

$$-T_1(s)$$

$$T_1(s)$$

$$\mathbf{T}_2(s+ds)$$

$$-T_2(s)$$

$t_{2i+1}$

$$t_{2i+2}^-$$

$t_{2i-1}$



$$t_{2i-2}^+$$

$t_{2i}^+$

$t_{2i}$

$t_{2i}$

$u_{2i+1}$

$u_{2i-1}$

$u_{2i-2}$

$u_{2i}$

$u_{2i}$

$u_{2i}$



$x_0$

$x_0$

$x_0$

$x_1$

$x_1$

$x_2$

$x_2$

$x_2$

$$x_{2i+1}$$

$x_{2i+2}$

$x_{2i-1}$

$x_{2i-2}$

$x_{2i}$



$x_{i+1}$

$x_{i-1}$

$x_{i-1}$

$x_i$

$x_i$

$x_{n-1}$

$x_{n-2}$

$x_n$

$$\tilde{x}_i^+$$

$\tilde{x}_i$

$\tilde{x}_i$



$$\frac{\|e_0\|}{2}$$

$$\frac{\|e_{n-1}\|}{2}$$