```
syms x a b x0 x1 x2 h h01 h12
syms Pa dPa Pb dPb
syms Px0 dPx0 Px1 dPx1 Px2 dPx2
syms P(x)
```

```
c_b = (h*dPa + 2*Pa)/h^3
```

c_b =

$$\frac{2\,\mathrm{Pa}+\mathrm{dPa}\,h}{h^3}$$

```
d_b = Pa/h^2;
P_b(x) = c_b*(x-b)^2*(x-a) + d_b*(x-b)^2
```

P_b(x) =

$$\frac{\mathrm{Pa}\ (b-x)^2}{h^2}-\frac{(2\,\mathrm{Pa}+\mathrm{dPa}\,h)\ (a-x)\ (b-x)^2}{h^3}$$

```
c_a = (h*dPb - 2*Pb)/h^3
```

c_a =

$$-\frac{2\,\mathrm{Pb}-\mathrm{dPb}\,h}{h^3}$$

```
d_a = Pb/h^2;
P_a(x) = c_a*(x-a)^2*(x-b) + d_a*(x-a)^2
```

P_a(x) =

$$\frac{\mathrm{Pb}\ (a-x)^2}{h^2}+\frac{(2\,\mathrm{Pb}-\mathrm{dPb}\,h)\ (a-x)^2\ (b-x)}{h^3}$$

```
P(x) = P_a(x) + P_b(x)
```

P(x) =

$$\frac{\mathrm{Pb}\ (a-x)^2}{h^2}+\frac{\mathrm{Pa}\ (b-x)^2}{h^2}-\frac{(2\,\mathrm{Pa}+\mathrm{dPa}\,h)\ (a-x)\ (b-x)^2}{h^3}+\frac{(2\,\mathrm{Pb}-\mathrm{dPb}\,h)\ (a-x)^2\ (b-x)}{h^3}$$

```
dP = diff(P, x);
d2P = diff(P, x, 2);

P1(x) = subs(P, [a b h], [x0 x1 h01]);
d2P1 = diff(P1, x, 2);
d2P1 = subs(d2P1, x1 - x0, h01);
d2P1_val = simplify(subs(d2P1(x1), x1 - x0, h01));
d2P1_val = subs(d2P1_val, [Pa dPa Pb dPb], [Px0 dPx0 Px1 dPx1])
```

d2P1_val =

$$\frac{2\ (3\,\mathrm{Px}_0-3\,\mathrm{Px}_1+\mathrm{dPx}_0\,h_{01}+2\,\mathrm{dPx}_1\,h_{01})}{{h_{01}}^2}$$

```
P2(x) = subs(P, [a b h], [x1 x2 h12]);
d2P2 = diff(P2, x, 2);
d2P2 = subs(d2P2, x2 - x1, h12);
d2P2_val = simplify(subs(d2P2(x1), x2 - x1, h12));
d2P2_val = subs(d2P2_val, [Pa dPa Pb dPb], [Px1 dPx1 Px2 dPx2])
```

d2P2_val =

$$-\frac{2\ (3\,\mathrm{Px}_1 - 3\,\mathrm{Px}_2 + 2\,\mathrm{dPx}_1\,h_{12} + \mathrm{dPx}_2\,h_{12})}{{h_{12}}^2}$$

```
eq = d2P1_val - d2P2_val == 0;
eq = collect(eq, [dPx0 dPx1 dPx2])
```

eq =

$$\frac{2}{h_{01}}\,\mathrm{dPx}_0 + \left(\frac{4}{h_{01}} + \frac{4}{h_{12}}\right)\mathrm{dPx}_1 + \frac{2}{h_{12}}\,\mathrm{dPx}_2 + \frac{2\ (3\,\mathrm{Px}_0 - 3\,\mathrm{Px}_1)}{{h_{01}}^2} + \frac{2\ (3\,\mathrm{Px}_1 - 3\,\mathrm{Px}_2)}{{h_{12}}^2} = 0$$