$$\left(\frac{\partial x}{\partial T}\right)_v = \frac{-\left(\frac{\mathrm{d}v'}{\mathrm{d}T}\right)(v''-v')-(v-v')\left(\left(\frac{\mathrm{d}v''}{\mathrm{d}T}\right)-\left(\frac{\mathrm{d}v'}{\mathrm{d}T}\right)\right)}{(v''-v')^2}$$

$$= \frac{\left(\frac{\mathrm{d}v'}{\mathrm{d}T}\right)+x\left(\left(\frac{\mathrm{d}v''}{\mathrm{d}T}\right)-\left(\frac{\mathrm{d}v'}{\mathrm{d}T}\right)\right)}{(v'-v'')}$$

$$= \frac{x\left(\frac{\mathrm{d}v''}{\mathrm{d}T}\right)+(1-x)\left(\frac{\mathrm{d}v'}{\mathrm{d}T}\right)}{(v'-v'')}$$

$$x = \frac{h-h'}{h''-h'}$$

$$\left(\frac{\partial x}{\partial h}\right)_p = \frac{1}{h''-h'}$$

$$\left(\frac{\partial x}{\partial p}\right)_h = \frac{-\left(\frac{\mathrm{d}h'}{\mathrm{d}p}\right)(h''-h')-(h-h')\left(\left(\frac{\mathrm{d}h''}{\mathrm{d}p}\right)-\left(\frac{\mathrm{d}h'}{\mathrm{d}p}\right)\right)}{(h''-h')^2}$$

$$= \frac{\left(\frac{\mathrm{d}h'}{\mathrm{d}p}\right)+x\left(\left(\frac{\mathrm{d}h''}{\mathrm{d}p}\right)-\left(\frac{\mathrm{d}h'}{\mathrm{d}p}\right)\right)}{(h'-h'')}$$

$$= \frac{x\left(\frac{\mathrm{d}h''}{\mathrm{d}p}\right)+(1-x)\left(\frac{\mathrm{d}h'}{\mathrm{d}p}\right)}{(h'-h'')}$$

$$\left(\frac{\partial x}{\partial p}\right)_s = \frac{-\left(\frac{\mathrm{d}s'}{\mathrm{d}p}\right)(s''-s')-(s-s')\left(\left(\frac{\mathrm{d}s''}{\mathrm{d}p}\right)-\left(\frac{\mathrm{d}s'}{\mathrm{d}p}\right)\right)}{(s''-s')^2}$$

$$= \frac{\left(\frac{\mathrm{d}s'}{\mathrm{d}p}\right)+x\left(\left(\frac{\mathrm{d}s''}{\mathrm{d}p}\right)-\left(\frac{\mathrm{d}s'}{\mathrm{d}p}\right)\right)}{(s'-s'')}$$

$$= \frac{x\left(\frac{\mathrm{d}s''}{\mathrm{d}p}\right)+(1-x)\left(\frac{\mathrm{d}s'}{\mathrm{d}p}\right)}{(s'-s'')}$$