Récap:

$$V_D = V_e \times \frac{Y_3}{Y_3+Y_4} \qquad V_A = \frac{V_e Y_1 + V_S Y + V_B Y}{2Y + Y_1}$$

$$V_B = \frac{V_S Y_2 + V_A Y}{Y_2 + Y}$$

On injecte V_A dans V_B

$$V_B = \frac{V_S Y_2 + Y\left(\frac{V_e Y_1 + V_S Y + V_B Y}{2Y + Y_1}\right)}{Y_2 + Y}$$

$$V_B = \frac{V_S Y + \frac{Y(V_e Y_1 + V_S Y + V_B Y)}{2Y+Y_1}}{Y_2 + Y} = \frac{\frac{(2Y+Y_1)V_S Y}{2Y+Y_1} + \frac{Y(V_e Y_1 + V_S Y + V_B Y)}{2Y+Y_1}}{Y_2 + Y}$$

$$V_B = \frac{V_S Y(2Y+Y_1) + Y(V_e Y_1 + V_S Y + V_B Y)}{(2Y+Y_1)(Y_2+Y)}$$

Comme $V_+ = V_-$ alors $V_B = V_D$

On a donc $\frac{V_S Y(2Y+Y_1) + Y(V_e Y_1 + V_S Y + V_B Y)}{(2Y+Y_1)(Y_2+Y)} = V_e \times \frac{Y_3}{Y_3+Y_4}$

$$\Leftrightarrow \frac{V_S \times 2Y^2 + V_S Y Y_1 + V_e \times Y Y_1 + V_S Y^2 + V_B Y^2}{(2Y+Y_1)(Y_2+Y)} = V_e \times \frac{Y_3}{Y_3+Y_4}$$

$$\Leftrightarrow \frac{V_S(2Y^2 + Y Y_1 + Y^2) + V_e Y Y_1 + V_B Y^2}{(2Y+Y_1)(Y_2+Y)} = V_e \times \frac{Y_3}{Y_3+Y_4}$$

$$V_s(3Y^2 + YY_1) + V_e(YY_1) + V_0 Y^2 = V_e \times \frac{Y_3}{Y_3+Y_4}\left(2Y + Y_1\right)\left(Y_2 + Y\right)$$

$$V_s(3Y^2+YY_1) = V_e\left(\frac{Y_3}{Y_3+Y_4} \times (2Y+Y_1) \times (Y_2+Y)\right) - V_e(YY_1) - V_0 Y^2$$

$$V_s(3Y^2+YY_1) = V_e\left[\frac{Y_3}{Y_3+Y_4} \times (2Y+Y_1) \times (Y_2+Y)\right] - V_e(YY_1) - V_e \times \frac{Y_3 Y^2}{Y_3+Y_4}$$

$$V_s(3Y^2+YY_1) = V_e\left[\frac{Y_3(2Y+Y_1)(Y_2+Y)}{Y_3+Y_4} - \frac{(Y_3+Y_4)YY_1}{Y_3+Y_4} - \frac{Y_3 Y^2}{Y_3+Y_4}\right]$$

$$V_s(3Y^2+YY_1) = V_e\left[\frac{2Y_2Y_3Y + 2Y^2Y_3 + Y_1Y_2Y_3 + YY_1Y_3 - YY_1Y_3 - YY_1Y_4 - Y_3Y^2}{Y_3+Y_4}\right]$$

$$V_s(3Y^2+YY_1) = V_e\left[\frac{2YY_2Y_3 + Y^2Y_3 + Y_1Y_2Y_3 - YY_1Y_4}{Y_3+Y_4}\right]$$

$$\frac{V_s}{V_e} = \frac{2YY_2Y_3 + Y^2Y_3 + Y_1Y_2Y_3 - YY_1Y_4}{(3Y^2+YY_1)(Y_3+Y_4)}$$