Para la función de transferencia del sistema masa resorte visto en clase

$$\frac{X_2(s)}{F(s)}$$

de la clase tenemos que

$$I(s) = \frac{1}{L_1} Y_1(s) + \frac{s}{R_1} Y_1(s) + s^2 C_1 Y_1(s) + \frac{1}{L_2}(Y_1(s) - Y_2(s))$$

$$I(s) = Y_1(s)\left[\frac{1}{L_1} + \frac{s}{R_1} + s^2 C_1 + \frac{1}{L_2}\right] - \frac{1}{L_2} Y_2(s)$$

$$I(s) = Y_1(s)\left[\frac{R_1 + sL_1}{L_1 R_1} + \frac{s^2 C_1 L_2 + 1}{L_2}\right] - \frac{1}{L_2} Y_2(s) \quad \ldots (1)$$

además

$$\theta = \frac{1}{L_2}(Y_1(s) - Y_2(s))$$

$$Y_2(s) = Y_1(s) \quad \ldots (2)$$

Sustituyendo (2) en (1)

$$I(s) = Y_2(s)\left[\frac{R_1 + sL_1}{L_1 R_1} + \frac{s^2 C_1 L_2 + 1}{L_2}\right] - \frac{1}{L_2} Y_2(s)$$

$$I(s) = Y_2(s)\left[\frac{R_1 L_2 + sL_1 L_2 + s^2 C_1 L_1 L_2 R_1 + L_1 R_1}{L_1 L_2 R_1} + \frac{1}{L_2}\right]$$

$$\frac{I(s)}{Y_2(s)} = \frac{L_2(R_1L_2 + sL_1L_2 + s^2R_1L_1L_2C_1 + L_1R_1) - L_1L_2R_1}{L_1L_2^2R_1}$$

$$\frac{I(s)}{Y_2(s)} = \frac{s^2R_1L_1L_2C_1 + sL_1L_2 + R_1L_2 + L_1R_1 - L_1R_1}{L_1L_2R_1}$$

$$\frac{I(s)}{Y_2(s)} = \frac{s^2R_1L_1L_2C_1 + sL_1L_2 + R_1L_2}{L_1L_2R_1}$$

$$\frac{I(s)}{Y_2(s)} = \frac{L_2(s^2R_1L_1C_1 + sL_1 + R_1)}{L_1L_2R_1}$$

$$\frac{I(s)}{Y_2(s)} = \frac{s^2R_1L_1C_1 + sL_1 + R_1}{L_1R_1}$$

$$\frac{Y_2(s)}{I(s)} = \frac{L_1R_1}{s^2R_1L_1C_1 + sL_1 + R_1}$$