

Achromatic colour vision with relative luminance

Mathematical equations with potential functions

$$F_{ab}(L_R, m) = b \tanh(x_r/a) = b \frac{L_R^m - L_R^{-m}}{L_R^m + L_R^{-m}} \quad \begin{array}{l} x_r = \log(L_R) \\ L_R = L/L_u \\ x_r \leq 0 \end{array} \quad [1]$$

$$\frac{dF_{ab}(L_R, m)}{dL_R} = \frac{4bm}{L_R[L_R^m + L_R^{-m}]^2} \quad \begin{array}{l} x_r = \ln L_R / \ln(10) \\ dx_r/dL_R = 1/(\ln(10)L_R) \\ m = 1/(\ln(10)a) \end{array} \quad [5]$$

$$\frac{L/dL}{(L/dL)_u} = \frac{4L}{L_R[L_R^m + L_R^{-m}]^2 L_u}; \quad \frac{dL}{dL_u} = \frac{L_R[L_R^m + L_R^{-m}]^2}{4} \quad [8]$$

$$\frac{L/dL}{(L/dL)_u} = 1 \text{ for } \begin{cases} L = L_u \\ x_r = 0 \end{cases} \quad \frac{dL}{dL_u} = 1 \text{ for } \begin{cases} L = L_u \\ x_r = 0 \end{cases} \quad [9]$$