1 **Exercise** Compute h^* for $R = 0.01$ m, $\eta_0 = 0.1$ Pas, $\alpha = 2 \cdot 10^{-8}$ Pa^{-1}, $u_1 + u_2 = 1$ m/s, $E' = 2 \cdot 10^{11}$ Pa, $w_1 = 10^4$ kg/m, using the parameters W_1, U and G. Same question using Figure 3.3.

2 **Exercise** Using Figure 3.3 find h^* for $R = 0.01$ m, $\eta_0 = 0.1$ Pas, $\alpha = 2 \cdot 10^{-8}$ Pa^{-1}, $u_1 + u_2 = 1$ m/s, $E' = 2 \cdot 10^{11}$ Pa, $w_1 = 10^4$ kg/m.

3 **Exercise** How much does the film thickness h change if the atmospheric viscosity η_0 is doubled? How much if the speed u_1+u_2 is doubled? How much if the load per unit length w_1 is doubled? How much if the reduced elasticity E' is doubled (careful)? How much if the reduced contact radius R is doubled (careful)?

4 **Exercise** The aim of this exercise is to keep the film thickness constant. How much does one have to change the speed $u_1 + u_2$ when the viscosity η_0 is halved? How much does the load have to change when the viscosity is doubled?

5 **Exercise** Express the Hertzian contact half width b in terms of W_1 and R.

6 (Dowson Higginson, line Contact) **Exercise** What is the dimensionless film thickness $H(X = 0)$ in the Figures 3.5 to 3.7? What is the relative evolution of $h(x = 0)$? Compare the evolution with the one predicted by Ertel-Grubin?

7 **Exercise** What is the dimensionless central film thickness $H(X = 0)$ in the Figures 3.9 to 3.14? What is the relative evolution of $h(x = 0)$, careful?

8 **Exercise** What is the dimensionless central pressure $P(X = 0)$ in the Figures 3.9 to 3.14? What is the relative evolution of $p(x = 0)$?

9 **Exercise** Compare the answers on $h(x = 0)$ and $p(x = 0)$ from the two previous exercises with the Figure 3.15.

10 (Dowson Higginson - fitted) **Exercise** Compute h_m for $R = 0.01$ m, $\eta_0 = 0.1$ Pas, $u_1 + u_2 = 1$ m/s, $\alpha = 2 \cdot 10^{-8}$ Pa^{-1}, $E' = 2 \cdot 10^{11}$ Pa, $w_1 = 10^4$ kg/m. Compare with the Ertel Grubin value, comments?

11 (Moes Venner, line Contact) **Exercise** What are the advantages of the set M_1, L over the set W_1, U, G? What are its disadvantages?

12 **Exercise** What is the order of magnitude of H_m^D and of H_m^M? Use typical values given before for oil/steel contacts.

13 **Exercise** Compute h_m for $R = 0.01$ m, $\eta_0 = 0.1$ Pas, $u_1 + u_2 = 1$ m/s, $\alpha = 2 \cdot 10^{-8}$ Pa^{-1}, $E' = 2 \cdot 10^{11}$ Pa, $w_1 = 10^4$ kg/m. Compare with the Dowson and Higginson value and the Ertel Grubin value, comments?

14 **Exercise** Express the Ertel Grubin formula in terms of H_{min}, M_1 and L.

15 **Exercise** Check the expression of the Moes Venner formula in terms of H_m^D, W_1, U and G.

16 **Exercise** Which of the three regimes is the appropriate regime for $M_1 = 1$, $L = 0$? and for $M_1 = 100$, $L = 0$? and for $M_1 = 100$, $L = 10$? and for $M_1 = 10$, $L = 1$ (careful)? Compute for each of the cases the film thickness H_m^M.